THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. JUNE 24, 1897. CHICAGO, ILL. NUMBER 25.

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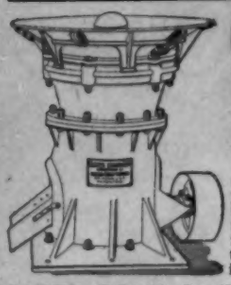

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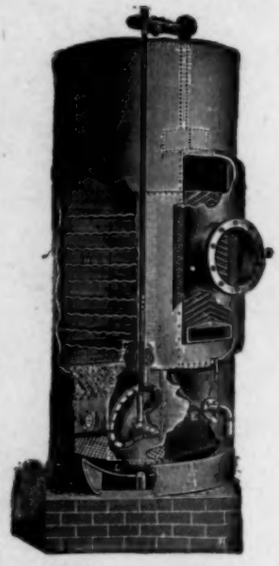

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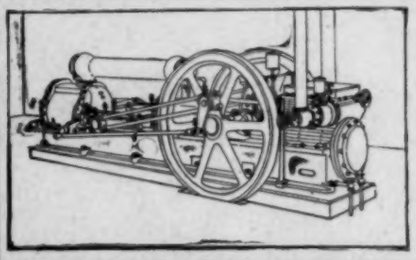

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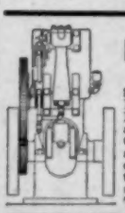

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THE IRON TRADE REVIEW

OLUME XXX. CLEVELAND, O. JUNE 24, 1897. CHICAGO, ILL. NUMBER 25

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

There is no diminution of the feeling of encouragement produced by recent developments in the iron trade However, buyers do not fail to sift the spurious from the genuine, in the prosperity statements that are going the rounds, since they are able very promptly to learn that sellers are not making the advances credited in certain boom dispatches. Pig iron buying has been less in the past week than in either of the two preceding, but the inquiry indicates that the large purchases by a few interests have led the average melter of iron to pay closer attention to the market, and have convinced some that conditions warranting a moderate advance may soon be met. The report crediting Russell Sage with buying 100,000 tons of Southern iron is not correct. It can be said that he has not been a buyer but it is true that a New York speculative interest has taken considerable amounts, less than 100,000 tons, deliverable by warrants in the next few months. This development is significant of the feeling among discreet investors that the turn has come. Southern producers have been strengthened in their position by these and other sales; but the low prices recently quoted by Northern sellers and the weakening in values of Mesabi ores have made them chary of any attempt to force the situation. It is appreciated that to maintain quoted rates would be a distinct gain and that to make advances would gradually bring reserve furnace capacity into the producing column. The slight flurry of two weeks ago in Bessemer pig has quite subsided. Sales reported are on the basis of $9.25 and $9.30 valley furnace and $9.50 to $9.75, Pittsburg, according to time of delivery. Billets are practically on the old basis—$14 to $14.25, Pittsburg, and $13.75 in the valley. The full operation of so many mills in June will make it easily the banner month of the year in tonnage. Specifications on contracts are freer; structural business, both for buildings and bridges, is still in good proportions, and bar mills have more work in hand than at any time in the year, largely because of the better condition of the agricultural machinery trade, and with practically no help from car builders. Yet with scarcely an exception mills are keenly competing for every contract and there is no form of material on which some seller will not quote the lowest price that has been named in the year. The larger demand in June, part of which is due to the very prospect of labor troubles, is being cited as an argument for leaving scale wages untouched. But Central Western iron manufacturers are quite firm in the position that unless the Amalgamated Association can bring into line again the mills that have cut the scale rates, it must give other mills like concessions, as long as present prices continue. The first tin plate conference brought out strongly the determination of the makers to pay no advance and of the men to make a long fight, if need be, to gain their end.

THE CLEVELAND DISTRICT.

Ore-buying has continued into the past week, but no large lots are to be added to those heretofore mentioned. Some valley furnaces have pieced out with cargo purchases of various ores, without contracting for their year's supply. There is considerable buying ahead, unless a goodly percentage of valley stacks is to continue inactive. The future position of Mesabi ores, with a 50 cent differential established by recent sales is a matter of some speculation. Having themselves made the 50-cent difference the big companies may find it difficult, by another season, to get back to the old basis. Perhaps there is a compensating element in the fact that the Carnegie-Rockefeller deal, which made the low prices of ore this year, has also resulted in cutting Mesabi prices so deeply that some of the advantage of the Carnegie interest, through being a miner of ore, is now eliminated. Lake freights are stationary at 40 cents, Escanaba, and 50 cents, Marquette and Duluth. With practically all the fleet in commission, surprisingly few boats have been offered ore shippers the past week.

Pig Iron There is a firmer feeling in foundry iron, though no change in quotations, but the Bessemer market is easier. Under the arrangements recently made for the control of blast furnaces, by Pittsburg interests, that have been buyers for some time back, the valley steel works become the chief dependence of sellers there. For far forward deliveries $9.40 to 9.50 valley furnace is asked, but transactions for third quarter delivery are reported at $9.25. Haselton furnace is preparing to resume and Tod Furnace of the Youngstown Steel Co., is expected to go in shortly. Struthers Furnace will probably not start for a month. Foundries are more liberal buyers and inquiries and sales are increasing. A 2,000-ton sale of coke iron for malleable purposes is reported at $9.75 at Erie. Recent sales of Bessemer in Cleveland involved trades of billets and rods, so that the basis is not quotable. We repeat Cleveland quotations:

Bessemer	$9 65@ 9 90	Valley Scotch No. 1	$10 50@10 60
No. 1 Strong Foundry	10 40@10 65	Valley Scotch No. 2	10 00@10 15
No. 2 Strong Foundry	9 6 @10 15	Gray Forge	8 75@ 8 90
No. 3 Foundry	9 25@ 9 50	Lake Superior Charcoal	12 75@13 00

Billets and Rods. A sale of 100 tons of open-hearth is reported at $17.25 delivered. A 1,000-ton inquiry is out for Bessemer billets. Quotations are in the neighborhood of $15. We quote rods at $20 to $20.50.

Finished Material. Bridge work is the most prominent factor in the local market. Several Ohio bridge companies have placed contracts ranging from 250 to 700 tons. The Wheeling & Lake Erie Railroad's nine bridges let this week have furnished considerable tonnage. Steel bars and bar iron have sharply competed in record-breaking prices. A sale of the latter is reported on a car-lot basis of 85c. in the valley. On steel bars half extras are entirely ignored and on one Cleveland contract involving rounds, 80c., base, Pittsburg, was quoted. Valley mills are running quite full this week, and recent orders have shown considerable improvement in volume. Sheets are unchanged, on basis of 1.95c. in small lots for No. 27 black. Old material has been offered at still lower prices, but mills being on the eve of a shut-down are not tempted. We quote old steel rails, long, at $8.50; mill scrap, $6.50 to $6.75; No. 1 railroad wrought scrap, $9.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, June 23.

Sales of material last week were not so large as those of the week before, but nevertheless were very satisfactory to the mills and furnaces. The continued demand has strengthened the market considerably, and in some lines sales are not being made at the extreme low prices of two or three weeks ago. The largest tonnage closed last week was in pig iron, of which probably over 25,000 tons was sold. Additional orders for bars were received, but the other branches of the steel market were quiet.

PIG IRON.—The total sales of last week were probably in excess of 25,000 tons of both Northern and Southern irons, the former getting the larger part of the business. The demand is still large, and additional sales are expected this week. The furnaces are not so willing to sell at low prices as they have been in the past three or four weeks, but are holding much more nearly to the published quotations. The large tonnage recently closed makes them more independent than they have been in a long time. This is true of both Northern and Southern furnaces. At the same time pig iron dealers do not expect an immediate advance in quotations, although they say one may come within the next three or four weeks. The business closed last week was well distributed, and comprised orders of all sizes, from 2,000 tons to car lots. The general run of buyers in this territory have apparently come to the conclusion that the present prices are as low as they will see for some time to come, and are making purchases for as long a time ahead as they can. Some of the sales made recently call for deliveries running as far as 18 months from July 1, but the bulk of them average deliveries for from six to eight months. The tone of the market has been improved by the reports of a large speculative sale of Southern iron to a New York syndicate. On one 100,000-ton block delivery will begin immediately and to extend over four months, and the prices are said to be about 25 cents under $6.50, Birmingham, for No. 2 foundry, $6.25 for No. 3 foundry, and $6 for No. 4 foundry and gray forge. It is reported also that the syndicate will make further purchases. The very low prices made on Southern soft irons have been withdrawn, and those given below represent the market now:

Lake Sup. Charcoal	$13 00@13 25	Southern No. 1 Soft	$10 25@10 50
Local Coke Fdy. No. 1	10 50@10 75	Southern No. 2 Soft	9 75@10 00
Local Coke Fdy. No. 2	10 25@10 50	South'n Silveries	10 25@10 50
Local Coke Fdy. No. 3	10 00@10 25	Jackson Co. Silveries	13 00@15 00
Local Scotch Fdy. No. 1	10 50@10 75	Ohio Silveries	13 00@15 00
Local Scotch Fdy. No. 2	10 25@10 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 00@10 25	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	10 25@10 50	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	9 75@10 00	Coke Bessemer	11 50@12 00
South'n Coke No. 3	9 50@ 9 75		

BARS.—The sales of last week were not nearly so large as those of the week before but were very satisfactory, and included some good contracts. The larger mills have secured considerable business in the past three weeks and are not making such sharp competition for the small lot business that comes, enabling the smaller mills to get better prices for their product. Prices still have a wide range, however, being made at 1c to 1.10c for both common iron and billet steel, while some mills quote as low as .90c. Guaranteed iron is quoted at 1.10c to 1.15c.

RAILS AND TRACK SUPPLIES.—Only a small business was done last week and the inquiry does not indicate any large contract to be closed soon. Most of the demand is for light section rails. Quotations are made: Rails, $19 to $21, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.90c to 2c; hexagon nuts, 2c to 2.10c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—The local mills report only a few small orders, and a lighter demand. Prices are made at $16 for billets and $21 for rods.

STRUCTURAL MATERIAL.—An office building in this city will be let soon, requiring about 1,000 tons of material. A hotel at South Bend, Ind., to be built immediately, will require possibly 700 tons. Aside from these there is not very much large building in sight, and none to be bid upon in the immediate future. Bridge building keeps up well, and orders for bridge material are frequent and fairly large. The Northwestern track elevevation is taking a good deal of material. Prices are unchanged but are inclined to be a little firmer. Quotations are as follows: Beams and channels, 1.15c to 1.20c; angles, 1.10c to 1.15c; plates, 1.10c to 1.15c; tees, 1.30c to 1.40c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—This market is quiet and sales are limited to small lots. The local mills are not running this week. Quotations are made as follows: Tank steel, 1.10c to 1.20c; flange steel, 1.25c to 1.35c; fire-box steel, 1.85c to 5c.

SHEETS.—Business is limited to small lots in nearly every case, and the demand does not show any very great improvement for the immediate future. Quotations are no stronger. They are made at 1.90c to 2c for No. 27 black, and 80 and 5 to 80 and 10 per cent off for galvanized.

MERCHANT STEEL.—Sales last week were a little better than those of the week before, and included some very good orders. Several quite large season's contracts were closed up. Prices are as follows. Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—There is a much better demand for old iron rails and several small lots and one of 2,000 tons changed hands last week. Prices vary considerably. Dealers are holding for $12 and better, but consumers as a rule are not willing to pay more than $11.50. Old steel rails are quoted at $7.50 to $8 and old wheels at $10 to $10.50. Miscellaneous scrap is quoted about as follows: Railroad forge, $10.50 to $11; dealer's forge, $9 to $9.50; No. 1 mill, $7.50 to $8; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8.50; axles, $13.75 to $14.25; cast borings, $2.75; wrought turnings, $4 to $4.50; axle turnings, $5.50 to $6; mixed steel, heavy, $6.25; stove plates, $5.50 to $6; heavy melting steel, $7.50 to $8.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, June 23.

Additional wage reductions and the uninterrupted rule of low prices on finished products, hide much that is reassuring in the week's business. The steady gain in volume of finished material begins to show evidences of permanency and in wrought pipe the first indication of better prices is seen. Structural mills are booked full for a month ahead and many of the orders in other lines will go to interests inactive for many months. The feature of the tonnage booked continues to be the small size of individual orders. In pig iron and steel the week has brought but little change other than firmer prices on foundry irons. Billets are slightly weaker.

PIG IRON.—Since the heavy buying of two weeks ago but little has been done in Bessemer either by valleys or Pittsburg. The asking prices of the former are slightly lowered for present delivery and $9.25 could probably be bettered on prompt iron. For later deliveries quotations do not weaken and $9.30 to $9.50 is asked at valley furnace and $9.50 to $9.75, Pittsburg. Foundry irons are taking on more life and show better prices on all grades. So far the buying has been meager. No. 2 is held firmly at $10, Pittsburg. Gray forge is not affected and is nominally $8.50 to $8.75. Duquesne furnace No. 4 was blown in on Bessemer on Monday afternoon. We quote:

Bessemer at valley furnace	$ 9.25 to $ 9.40
Bessemer delivered Pittsburg District	9.75 to 9.90
No. 1 Foundry	10 50 to 10.75
No. 2 Foundry	10.00 to 10.25
No. 3 Foundry	9.25 to 9.50
Gray Forge	8.50 to 8.75

BILLETS.—While a good volume of business is going in billets, it comes in small lots. The prices secured are slightly weaker, $14.00 being possible at Pittsburg, or valley mills. Forward deliveries add 25c to 50c to this quotation, according to time limits. Sheet bars are likewise active in lots of small size, and quotations on quick shipments are $17.25 to $17.50.

RAILROAD AND TRACK MATERIAL.—Prices are quoted on track material as follows: Splice bars, 1.10c to 1.15c; track bolts, iron, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c. Links and pins are quoted at 1.20c to 1.25c. Rail specifications keep up well. On new business rails are quoted nominally at $20 at mill.

WROUGHT PIPE.—Although the prices secured on current pipe orders are no higher than quoted rates, the ideas of buyers no longer dictate terms of settlement. Unprofitable cutting has been less frequent and quoted rates are well sustained. The orders placed are small in bulk but go largely to interests

long inactive. Mills are running full. Quotations made are as follows: Merchant black, 57 to 67 per cent off; galvanized, 52 to 55 per cent off, six tens for less than carload lots, six tens and 2½ per cent on carload lots. Specifications for casing and tubing are heavier and asking prices are 10 per cent higher. On merchant boiler tubes, prices are made as follows: Two and a quarter inches and smaller, 75 and 10 per cent discount; two and a half inches and over, 80 per cent discount; casing, inserted joints, 57½ per cent discount; screw and socket joint, 62½ per cent discount.

STRUCTURAL MATERIAL.—Bridge work and demand for plain material are features of the week's business, and the total of sales adds to the encouraging aspect of the market. Prices are slow in showing any change and beams can still be had at 1c, although mill quotations are 1.10c. The two Pittsburg mills are fairly easy with four weeks' full running assured ahead. New York City keeps up its heavy sales of fitted shapes. Other quotations are made as follows: Angles, 1c to 1.05c; tees and zees, 1.15c to 1.20c; universal plates, 1c to 1.05c. Like beams, these are shaded in competition.

PLATES.—The Minneapolis work is still pending as far as plain material is concerned. Current business grows steadily from week to week, specifications on contract being unusually liberal. Prices are stationary, as follows: Bessemer tank, 1c to 1.05c; open-hearth, 1.05c to 1.10c; shell, 1.20c to 1.25c; flange, 1.25c to 1.30c.

MERCHANT STEEL.—Buying is of the steady sort and shows evidences of permanency. Certain local mills are taxed in some lines to get out shipments. Asking prices are more closely adhered to, as follows: Open-hearth spring, 1.35c to 1.40c; open-hearth machinery, 1.15c to 1.20c; machine straightened tire, 1.25c to 1.30c; soft steel bars, 1.25c; toe calk, 1.35c to 1.40; sleigh shoe, 1.25c; tool steel, ordinary, 5c to 7c; branded, 10c upwards.

SKELP.—Prices in Skelp are much more steady, although asking prices are no higher. Demand also is more healthy. Quotations follow: Grooved steel skelp, 92½c to 95c; sheared steel skelp, 1c to 1.05c; grooved iron skelp, 1c to 1.05c; sheared iron skelp, 1.15c to 1.17½c.

SHEETS.—Light gauges of black sheets have been active in the last few days, owing doubtless to the prospects of labor difficulties. Better prices have ruled and delivery late in July is very difficult to get. Beyond this, mills refuse to sell. The tin plate schedule remains unsettled and must come up for further conference. Prices of sheets for tinning are only slightly affected. On black sheets prices are asked as follows: No. 26, 1.85c to 1.90c; No. 27, 1.90c to 1.95c; No. 28, 1.95c to 2c. Galvanized sheets are quoted at 80 and 5 per cent off list.

BARS.—The improved demand for steel bars is offset by the low prices ruling. Time contracts are rumored to have been taken at prices as low as anything yet reached in steel bars. There is still considerable business pending and much was closed last week. Quoted rates are 95c to 1c. Bar iron is quoted in Pittsburg at 90c to 1c. Muck bar, at $17.25 to $17.50, is at low tide. A sale of 500 tons was reported in the week at $17.25. Branded iron is firm and makers of some grades are getting stronger prices.

FERRO-MANGANESE.—Domestic, 80 per cent, holds at $45.50.

OLD MATERIAL.—With the heavy buying interest that has been covering of late well supplied, steel scrap has shown a slight reaction. Evidences of better conditions have not entirely disappeared and some lines are fairly active. Steel rails sold in the week at $9.25 and $9.40 and No. 1 wrought scrap at $10.35 to $10.50. Two sales of car wheels are reported at $9, for Buffalo and Chicago delivery.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The animation noted last week has been more pronounced each day since and the market is firm, with an advancing tendency. While much of the confidence prevailing is born of hope, it is certain that many plans and enterprises held in abeyance during the period of depression are being revived and put under way, which awakens a better feeling throughout the trade. Some of the furnaces refuse to meet the desires of consumers wanting extended future deliveries, fully believing they will realize at once or very soon better prices than those current. We quote for cash, f.o.b. cars Cincinnati: Southern coke, No. 1 foundry $9.25 to $9.75; No. 2, $8.50 to $8.75; No. 3, $8.25 to $8.50; gray forge, $8.25; mottled, $8 to $8.25; No. 1 soft, $8.75 to $9; No. 2, $8.50 to $8.75; Belfont Coke No. 1, Lake Superior $11 to $11.25; No. 2, $10.50 to $10.75; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson Co. silvery, No. 1, $12.50 to $13; standard Georgia car wheel, $14.25 to $15; Tennessee car wheel, $13 to $14.

Philadelphia There is general activity at mills and outward appearances would indicate improvement. It is true that the June tonnage will be the largest of the year, but this is in a measure due to the expected shut-down the early portion of July. There is no great amount of new business, and prices continue as in the preceding week, with sharp competition for special orders. On material for a new vessel in a local shipyard the prices made were very low and competition from an unexpected source came in. The Illinois Steel Co. took the boiler plates. The hull plates and shapes went to near-by mills. A larger order is to be let this week, for ship material. We quote plates at 1.15c to 1.20c; refined bars, 1.10c; steel bars, 1.10c to 1.15c; angles, 1.15c to 1.20c; beams, 1.15c to 1.20c. The market for steel is weaker, after a brief season of bullish sentiment. Some little steel went at $16.50, but $16.25 or lower can be readily done now. Recent developments have taught buyers the necessity of keeping close watch on the market and the possibilities of changes for the better are better appreciated than was the case three weeks ago. The pig iron situation is reasonably firm. It can be fairly said that some of the lowest offers of two or three weeks ago are not being accepted now, but the volume of business is not larger than in the past 10 days, perhaps not so large. It is generally conceded, however, that the market has got over the dragging, lifeless condition that prevailed so long previous to the recent turn for the better. We quote for seaboard delivery: No. 1 X foundry, $11.75 to $12 50; No. 2 X foundry, $10.75 to $11.25; No. 2 plain, $10.25 to $10.50; standard mill iron, $10.00 to $10.25; ordinary mill iron, $9.50 to $9.75. Old material has a little better sale but there is no quotable change in prices, as the supply is quite large. There are reports of a better demand for rails in the past two weeks, Pennsylvania mills having booked orders for several lots. The Pennsylvania Steel Co. and the Cambria Iron Co.'s rail mills are reported to be running, and the Maryland Steel Co. recently took an order for 7,500 tons for shipment to India.

Personal.

President C. M. Schwab, of the Carnegie Steel Co., Ltd., has been in conference with the Homestead board of education recently, perfecting plans for the industrial school he is to build for Homestead at a cost of $25,000. The manual training schools at Buffalo and Cleveland have been visited and the latter will be patterned after in the main.

F. R. Upton, of Pittsburg, has resigned as general sales manager of the National Tube Works Co. and has severed his connection with the company. He is succeeded by Edward Worcester. Mr. Upton has returned to New York and will engage in other business.

Edward L. Ford, general superintendent of the Youngstown Steel Co., Youngstown, O., and one of the most experienced of valley furnacemen, has gone on a European trip. He will visit furnaces and steel works in England, Belgium and Germany.

John M. Mulrooney, editor of the *Marine Review*, sails from New York this week to attend the International Congress of Naval Architects and Marine Engineers to be held in London early in July. The meeting is under the auspices of the Institution of Naval Architects of Great Britain. The proceedings and the descriptions of equipment of shipyards to be visited by the delegates will be given in a series of letters by Mr. Mulrooney in the *Marine Review*.

PARTICULARS multiply of foreign shipments of American iron and steel products. Bassett, Presley & Train, Cleveland iron and steel jobbers, report that they made shipment last week of a quantity of their extra quality "Crown" iron, angles, channels and plates to South Africa. The order was taken in competition with English mills which formerly monopolized the South African market.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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JUNE 24, 1897.

SOME SIGNS OF IMPROVEMENT.

There is scarcely any dissent from the statement that the business of the country has come upon better times in the past month. Some fictitious prosperity has been detailed in newspaper dispatches, many of which have been sent, no doubt, because improvement talk was in the air, and significance has been given to various industrial resumptions that were not at all related to any general movement toward better conditions. But beginning with the money and security market and going down the line to the growing crops in the West and Northwest, there has been substantial agreement in the report of better feeling, improving prospects for business just ahead and, in many cases, of considerably enlarged present demand. For more than a month the stock market has shown an upward movement, with scarcely a trace of reaction; and it is significant that the improvement in railroad securities is most marked in the case of those Western railroads which will reap the largest benefit from the enormous crops of which there are continually brightening prospects. A fact closely related to the crop probabilities of 1897 is that Western farmers have been able in the past half year to make not a little headway in the cancellation of their indebtedness to the great agricultural machinery industry. Most implement manufacturers find collections better now than at any time in the past four years, and their preparations for the output of the next year indicate larger expectations than they have dared to entertain since 1893.

The railroads, in consequence of their liberal rail purchases in the winter and early spring, have been, thus far in 1897, very poor customers of locomotive and car-building works; but expenditures for rolling stock are next in order, and the movement of the crops is expected to demonstrate the need of such investments on the part of Western roads, as well as to help in solving the financial problem involved.

So far as the foundry, engineering and machinery trades are concerned, the situation is a mixed one thus far. All have complained seriously since the year opened, both of the disappointing volume of business and of the further havoc made of prices long notoriously bad. Yet it can be said that in the past month a better outlook is visible so far as demand is concerned.

The Iron Trade Review has advices from 50 to 60 representative concerns, in engine, boiler, power transmission, machine tool and other lines, particularly those in position to note any improvement in inquiry for steam power plant for industrial uses, and those in closest touch with the users of machinery for finishing iron castings. Boiler manufacturers say that inquiry that has recently come up gives promise of a perceptible improvement in the second half of the year over what has been done since the November election. One company notes more inquiry in the second ten days of June than in the preceding ten weeks. Another says that prices are very low, but a little stronger than a month ago, though they are likely to continue below the normal until boiler makers generally are busy. From another firm the response comes that the great trouble is that of low prices, prevalent in all manufacturing lines, and that while its works are fairly busy there is not, as yet, evidence of such a revival in the business of its customers as would lead to expectations of large orders from them.

The amount of business now being figured on for manufacturing establishments is the hopeful indication noted by engine builders. There is more talk of new installations than in 1896, and manufacturers of high-speed engines report that for power purposes, aside from electric lighting, there is more figuring than for some time.

Foundries that depend on rolling mill and steel works demand write that while business is far from normal, there is a greater willingness to place orders than for some months.

In mining equipment there is no special change discernible. The year has been very unsatisfactory thus far. The air compressing field has gradually enlarged, however, and in coal-mining particularly, the handicaps of hand operators under the low prices of the past year, have compelled them to turn to machinery. In general the compressed air field is broadening and high pressure work in particular is showing an increase.

Manufacturers of pumps, whose trade is to a considerable extent with industrial establishments, find more numerous inquiries and are hopeful of a considerably better business from early fall throughout the year. Steam specialty concerns, and manufacturers of equipment for the boiler room note an increase in inquiries and orders in the past three weeks. Machine tool firms have little evidence of brightening conditions at home, and, as in the early portion of the year, find that foreign orders are the most satisfactorily part of their business. Some of them speak hopefully of the last four months of the year.

A number of our correspondents aver that they look for no marked improvement until the tariff bill is disposed of. Happily the indications are a trifle more reassuring on this score, and three weeks

more are expected to bring certainty as to the schedule of duties, in place of the doubt and conjecture that are responsible for much of the hesitation of today.

THE iron manufacturers of the Mahoning and Shenango valleys take a very proper position relative to the scale which will be presented by the Amalgamated Association at the conference of next week. Unless the Amalgamated Association can bring back to the $4.50 puddling basis, with corresponding finishing rates, the Pittsburg mills in which its members have been working for the past two or three months at $4 for puddling and at reduced rates for finishing, it cannot consistently ask the valley mills, which must meet Pittsburg in the market, to sign the old scale. The alternative which the Western manufacturers offer is: either organize again the Pittsburg mills which have broken away or so adjust the scale that other mills shall be able to make competitive prices. It is understood that the position above stated will be firmly adhered to. The trying competition of the past three months has demonstrated that on to-day's level of prices the maintenance of a separate basis of wages in the valleys is out of the question.

THE foreign outlet for Southern iron has been a timely development for Alabama furnaces, in view of the sharp competition they have been encountering in the past six months from Northern irons. Furnaces in the Chicago district have been making prices that have crowded back the Southern product, which, owing to the turning of Chicago furnaces to Bessemer iron in the boom of 1895 had been regaining some of the ground lost in the West in 1894. And in the Central West and in those Eastern districts in which Lake Superior ores have entered considerably into foundry mixtures, the low ore prices of 1897 have made themselves felt. This advantage of the Northern furnaces has been prospectively increased, moreover, by the cut of 25 cents in the price of Mesabi ores that has come in the past two or three weeks. To be sure, this was on Mesabi Bessemers, but the non-Bessemer product of the new range will of course share in the decline. More and more, as the result of the very low prices made on foundry irons by Northern furnaces, Southern sellers are compelled to rely on their soft irons, for Northern trade. These, by reason of their cheapness, as compared with special Northern softeners—those of Southern Ohio, for example—continue to have a good market. Indeed, of late, Southern softeners have been increasingly scarce.

PRESENT indications are that the 40-cent rate on iron ore will be a feature of the new tariff bill in its final shape. The Pennsylvania Senators have made a struggle for an amendment permitting iron ore from mines controlled by American consumers to come in free, the aim being to give cheaper ore to some of the Eastern steel works interested in Cuban mines. The sentiment among the majority of Senators has proved to be quite strongly against such discrimination.

FURNACE 4 of the Duquesne plant of the Carnegie Steel Co., Ltd., was blown in on Monday afternoon, being lighted by a son of General Superintendent H. B. Miller. The Uehling casting apparatus has not yet been completed and Bessemer iron will be made for the present. Upon the completion of the casting machine Furnace 4 will be put on basic pig.

Weldless Tube Consolidation.

The consolidation of three well known plants for the manufacture of weldless steel tubing in the United States, which was under negotiation some time ago, is now reported as accomplished. H. A. Lozier, the well known Cleveland bicycle manufacturer, who controls the plants at Ellwood and Greenville, Pa., has sold large interests in them to English capitalists. The Pilkington interest, which controls tube manufactories in England, is largely represented in the deal. The American Weldless Tube Co., of Toledo, in which English capital is interested, is also included in the sale. It is understood that Mr. Lozier has a majority interest in the American combination, as well as in the Stiefel patents in the United States. Some time ago the Star, Climax, Credenda, and St. Helen's tube companies in England were combined under the name of Tubes, Ltd., and the deal just completed for the three properties in this country seems to be in line with a plan for international control.

Conferring on the Wage Scale.

Wage conferences are on and more than the usual interest is shown in the outcome. The tin plate conference last week, as is the custom with preliminary conferences, was not productive of a settlement. Considerable bad feeling was anticipated by the manufacturers, and in this respect the meeting was a disappointment, but no common ground could be reached and an indefinite adjournment was taken. Rumor is current to the effect that two mills were willing to concede an advance somewhat less than that demanded, provided scales were signed before July 1. Other reports hint at compromise as the probable outcome of the difficulty.

The sheet mill scale was taken up in conference on Wednesday, June 23, at the headquarters of the Association of Iron and Steel Sheet Manufacturers in the Conestoga Building, Pittsburg, where a preliminary meeting of the association had been held Tuesday. The manufacturers' committee has given notice that it will be ready for a conference on the puddling and bar mill scales June 30. The conference will be held in Youngstown.

AT the south works of the Lackawanna Iron and & Steel Co., Scranton, Pa., the tonnage men quit work Monday, the Saturday pay day showing that the recent reductions in wages were more than some of the workers had understood. Pilers were reduced from 66 cents to 33 cents per 100 tons; clippers from 44c. to 37c.; gaugers from 44c. to 36c.; drillers from 49c. to 34c.; straighteners from 66c. to 56c and inspectors from 65c. to 45c. At a conference with officers the statement was made that the company could not operate without loss on any higher basis. About 2,500 men are idle.

A REDUCTION in wages was made last week at the works of the Shoenberger Steel Co., Pittsburg, affecting exclusively skilled and tonnage men. The reduction varies and in some cases is a readjustment called for by installing new machinery. About 100 men in the horse shoe department struck against the reduction, but otherwise the entire plant is in operation.

AN inspection of the Otto by-product coke plant of the United Coke & Gas Co., at Glassport, Pa., was made by the officers and directors last week, in charge of John F. Wilcox, general manager. The plant of 120 ovens is in full operation and the product is taken for some time ahead. The by-products find a ready sale.

THE Bellaire Steel Co., Bellaire, O., closed down its plant at the end of last week and will not resume until about Aug. 15. Meantime extensive improvements, as already indicated in these columns, are to be made, which will nearly double the output of the steel mill.

THE National Tube Works Co. has declared the regular quarterly dividend of one and three-eighths per cent on the preferred stock, payable July 1.

SAFETY TOP FOR BLAST FURNACES.

Various modifications of blast furnace tops have been devised since Mesabi ores have come to be used in considerable quantities in furnaces supplied with ores from the Lake Superior region. Provision for larger area for the carrying off of gases has been made in some cases, by branchings from the top of the furnace to a bustle pipe; and explosion doors have been devised, to give ready vent to accumulated gases. The form of safety top devised by Mr. F. H. Foote for the Illinois Steel Co.'s furnaces is shown in the accompanying illustration. The object of the device, as of the others referred to, is to lessen the dangers attending the sudden formation of explosive gases. The apparatus described is calculated to relieve sudden pressure and permit the explosive gas and flames resulting therefrom to escape without damage to the furnace or injury to the operatives.

Fig. 1 shows a furnace top with a dumping platform B, having a railing b around the outer edge to prevent the operatives falling over the edge. The platform is of steel and is held in position on the brickwork of the furnace by a series of posts C C′, securely anchored to the furnace shell. The platform is provided with a central opening b', in line with and of the same size as the opening in the upper part of the furnace. In this opening is inserted the hopper D. This is secured to the shell, and a set of angular braces E connect it with a supporting ring E′. This supporting ring is secured to the metal beams e', which in turn are secured to the supporting parts. The hopper is provided with a movable feed-bell G, so arranged as to have the desired vertical movement for the purpose of admitting the ores and other materials to the furnace.

To provide means for the safe exit of excess of pressure due to sudden explosions, angular braces E are provided, and between each set of braces is a swinging door H, pivoted at its upper portion h to a ring H′, that surrounds and secures the braces to the hopper portion. These doors are arranged at an angle of about 30 degrees to the perpendicular, and are of iron and heavy, so that if they are opened from any cause they will immediately fall back into their normally-closed position on the cessation of the pressure. The "explosion doors" and the outer side of the hopper form an annular V-shaped channel of an area about equal to the area of the narrowest portion a of the furnace, so that when an explosion occurs the pressure in almost all instances enters this annular V-shaped channel and forces its way out through the point of least resistance, viz., the swinging doors. The operatives on the dumping platform are protected from the flames by means of the metal floor, so that the flames pass through the surrounding atmosphere without damage to the operatives or mechanism.

Figs. 2 and 3 show modified forms of doors and supporting framework, which are water-jacketed in order to prevent undue expansion or contraction of the metals and consequent warping which might take place from being in contact with high degrees of heat.

In Figs. 2 and 3, E^2 is the supporting rim, and E^3 angular braces or ribs that assist in supporting the hopper as well as providing a framework for the explosion doors. These braces are made hollow, so as to provide chambers e^5, and are provided at their lower ends with inlet pipes e^6, by which water is admitted. The ribs are provided with projecting bosses E^4 at their upper portion, and the explosion doors H^3, with lugs h^4 at their upper portions, arranged to come opposite the bosses on the ribs or framework. The lugs of the doors are perforated and the bosses of the ribs are provided with threaded openings, so that hollow plugs or pivots K may be inserted through the lugs to engage with the bosses on the ribs. These pivot plugs are shouldered, so as to be securely tightened against their shoulders and prevent movement. They are also provided with axial openings k, that register with openings d^1 in the ribs, so that water may flow through the ribs, through the opening e^7 in the bosses, through the axial openings k in the pivot plugs, through the radial opening k' in the pivot-plug to enter the water chambers H^4 of the explosion-doors. In the figures only one lug is shown, but the opposite lug is provided with a similar pivot plug, so that water may flow through the door into the next rib or brace of the framework, and from there on into the other doors, as desired.

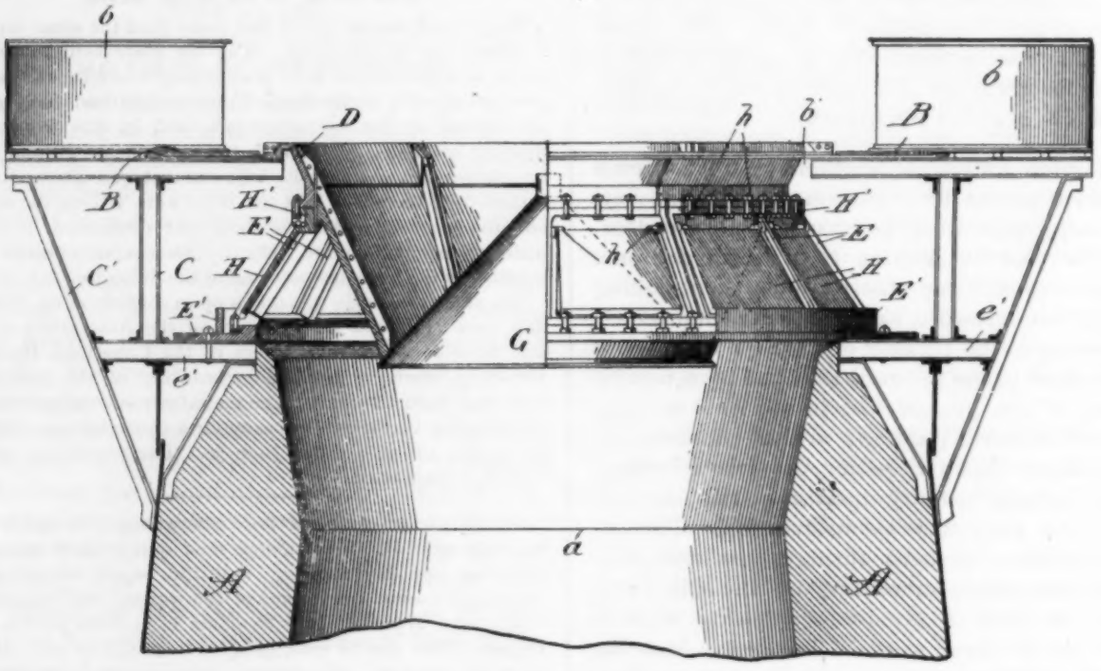


FIG. 1—SAFETY TOP FOR BLAST FURNACES.

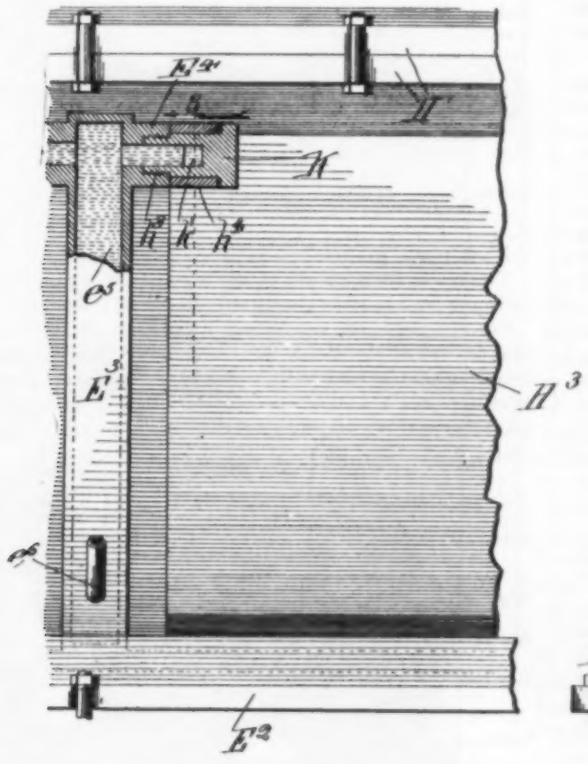
THE June issue of the *Boiler Maker*, the monthly issued by Jos. T. Ryerson & Son, of Chicago, is considerably larger than any previous issues, having 54 pages with cover, of which 25 pages are devoted to the discussion of topics interesting to the trade, while the balance contains the monthly stock list of the material and machines carried by Ryerson & Son. The journal is printed on better paper than that used heretofore, is well illustrated, and contains much valuable information. It is one of the most creditable "house organs" issued.

THE reconstruction of the old furnace of the National Tube Works, formerly turning out 16 to 24-inch pipe, was completed last week and on the initial heat 30-inch pipe was successfully made. The furnace can now make 36-inch pipe and is the first to produce pipe of this size.

LAKE SUPERIOR IRON MINES.

The following statement is made in Wall street as to the outlook for Minnesota Iron Co. stock:

"The annual meeting of the company was held at Duluth last week and the figures submitted showed that the company had earned in 1896 something over 6 per cent on the stock, after deducting surplus earnings by the boats of $169,000, which were charged to depreciation account, and over $50,000 for other extraordinary expenses. The company has not paid dividends because it added to its ore lands, at a cost of $1,500,000, which it paid for out of earnings, and it made extensive improvements on the Duluth & Iron Range Railroad, built a new dock, and put the mines in the best condition possible for cheap operation without issuing certificates, and wholly out of earnings. The company has so far sold 1,600,000 tons of ore for this season's delivery. Last year had two months of active business, but the remainder of the year was one of the dullest on record. Friends of the property say they investigated it carefully, going through the mines and over all the property, and found it in such a condition that further expenditures for betterments, either on the mines, the railroad, or the steamboats, are unnecessary."



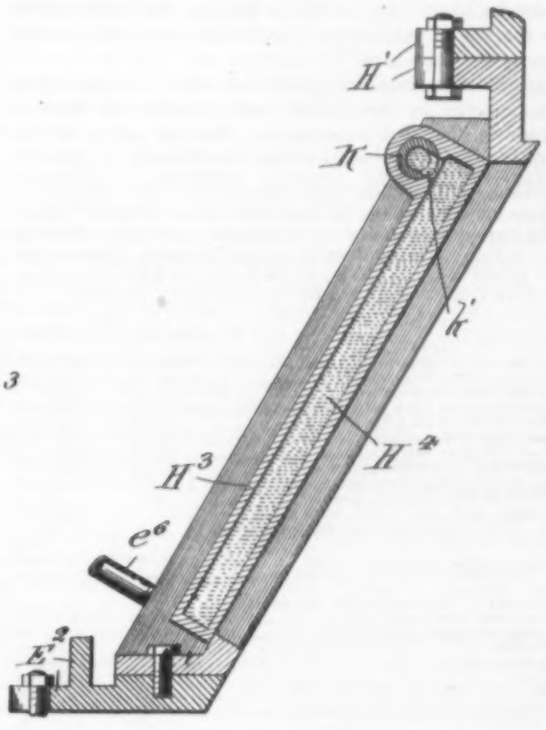


FIG. 2—SAFETY TOP FOR BLAST FURNACES.—FIG. 3.

Mr. C. P. Coffin, secretary of the Minnesota Iron Co., says that the main statements above are correct in all except one particular. That is that the company did pay dividends last year of 3 per cent, 1½ per cent each in April and July. It is also stated that additional sales of about 200,000 tons of ore have been made by the company since its annual meeting. Options are out for quite a large tonnage of ore, and it is likely that a large part of these will be taken up by the buyers. The total sales of the company cannot be estimated, but it is safe to say that they will be increased very materially over the 1,800,000 tons already sold. It has been stated lately by a stockholder of the company that the book value of its stock, based on conservative valuations of its property, is in the neighborhood of $125. The sales made this year, on the same authority, are such that it is practically assured that the company will have satisfactory earnings, although whether it will declare a dividend or not can only be determined later.

A suit attended by Wm. G. Mather, president of the Cleveland-Cliffs Iron Co.; Wm. D. Rees, treasurer of the Lake Superior Iron Co.; Alfred Kidder, agent of the Pittsburg & Lake Angeline Iron Co., and other well known Lake Superior mining men was on trial last week at Marquette, Mich. Mining land is involved, which contains newly developed property of the Cleveland-Cliffs Co. on the south side of the old basin of Lake Angeline at Ishpeming. The Pittsburg & Lake Angeline Co. claims lands from its old shore line to the center of the old lake bottom. The ore underneath the disputed territory is high-grade Bessemer. Whatever the decision, it is quite certain that the case will be carried up. D. H. Bacon, of the Minnesota Iron Co., formerly with the Cleveland Iron Mining Co., and F. P. Mills, of Colorado, who was for many years superintendent of the company's properties at Ishpeming, are witnesses in the case.

Wm. J. Olcott, who has made an exceptional record as general manager of the properties of the Lake Superior Consolidated Iron Mines, assumes also the duties of first vice-president of the Duluth, Mesabi & Northern Railroad, having been elected last week.

A recent ore-loading record is that of 40,000 tons put into vessels at the Duluth docks in 24 hours.

In the next six months 150,000 to 200,000 yards of surface will be removed at the Biwabik mine. The Drake & Stratton Co. has the contract. Two steam shovels and 150 men will be employed. It is understood that some concession on the 50-cent royalty at the Biwabik has been secured.

The statement in this column last week that the lease of the Norman mine on the Mesabi range has been surrendered was incorrect. The Norman Iron Co. will continue to operate the property.

Two mortgages on the Franklin mine have been filed at Duluth. The consideration in each was $124,000 and the assignment, which is dated Jan. 1, 1896, is from Wm. Rockefeller to John D. Rockefeller.

The Cloquet mine at Eveleth, Minn., formerly known as the Vega, has closed down. The pumps have been raised. Fifty men are idle.

At the Soudan mines of the Minnesota Iron Co., 900 men are now employed and 2,000 tons a day is hoisted, while 3,000 tons additional is shipped from stockpile. Wages are the same as last season and will not be changed. At the Chandler mine 90 cars a day are sent forward and 400 men are at work.

Section 21 mine of the Lake Superior Iron Co., at Ishpeming, Mich., has ceased work entirely, except the operation of pumps. Seventy-five men are thrown idle. About 60,000 tons of ore is in stock.

W. J. RAINEY will build 80 additional coke ovens at the Paul plant of 417 ovens.

MINERAL PRODUCTION OF 1896.

The statistics showing the output of the mines and metallurgical works of the United States in 1896 have just been officially published by the United States Geological Survey. They show a total value for metallic and non-metallic products in that year of $611,510,700, as compared with $622,687,688 in 1895. Most extensively produced and most valuable of all is coal. The product of 1896 was 190,639,959 short tons, valued at $195,557,649, against 193,117,530 short tons in 1895, valued at $197,799,043. The decrease in product was entirely in Pennsylvania anthracite. The output of bituminous coal increased from 135,118,193 to 136,868,069 short tons, or by 1,750,000 tons, though the value was $1,600,000 less than in 1895. The average price obtained for anthracite at the mines increased from $1.41 in 1895 to $1.51 in 1896. For bituminous coal, the average price declined from 86 cents to 83 cents. Pennsylvania led in production of bituminous coal, with an output of 49,101,148 tons. Illinois was easily second with 19,786,626 tons. West Virginia and Ohio are third and fourth respectively, with outputs of 12,876,296 tons and 12,875,202 tons. Ohio lost 480,000 tons from 1895, while West Virginia increased her output by 1,500,000 and Illinois by 2,000,000 tons. The anthracite production of Pennsylvania was 53,771,890 short tons, valued at $81,415,785. Alabama is fifth in the list of producers of bituminous coal, with an output of 5,745,617 short tons.

The details of our mineral production in 1896 are given below, as reported by the United States Geological Survey. The products specified number 57. The list given in the *Mineral Industry*, published under the auspices of the *Engineering and Mining Journal*, contains 81 different articles, though there are some duplicates to be deducted in making up valuations—as, for example, coke, included under coal, and pig iron, included in part under iron ore. Making these deductions the total value of the mineral product for 1896, as given by the *Mineral Industry*, is $706,015,411, as against $611,510,700, as given by the Geological Survey:

PRODUCTS.	1896. QUANTITY.	VALUE.
METALLIC.		
Pig iron (spot value), long tons	8,623,127	$90,250,000
Silver, coining value, troy ounces	53,227,00	68,818,750
Gold, coining value, troy ounces	2,491,317	51,500,000
Copper, value at New York City, pounds	453,007,139	48,698,267
Lead, value at New York City, short tons	187,000	10,472,000
Zinc, value at New York City, short tons	81,499	6,519,920
Quicksilver, value at San Francisco, flasks	30,765	1,075,449
Aluminum, value at Pittsburg, pounds	1,300,000	520,000
Antimony, value at San Francisco, short tons	601	84,290
Nickel, value at Philadelphia, pounds	17,170	4,464
Tin, pounds		
Platinum, value (crude), at San Francisco, troy ounces	163	944
Total value of metallic products		$277,944,084
NON-METALLIC (Values at producing point).		
Bituminous coal, short tons	136,868,069	$114,141,864
Pennsylvania anthracite, long tons	48,010,616	81,415,785
Building stone		31,346,171
Petroleum, barrels	59,960,967	57,783,619
Natural gas		12,450,260
Brick clay		9,000,000
Clay (all other than brick), long tons	360,000	800,000
Cement, barrels	9,479,473	6,378,385
Mineral waters, gallons sold	21,668,345	4,005,688
Phosphate rock, long tons	948,720	2,868,954
Salt, barrels	14,301,853	4,164,982
Limestone for iron flux, long tons	4,120,102	2,060,000
Zinc white, short tons	20,000	1,400,000
Gypsum, short tons	224,139	572,344
Borax, pounds	13,508,000	675,400
Mineral paints, short tons	48,032	539,455
Grindstones		326,826
Fibrous talc, short tons	46,089	399,443
Asphaltum, short tons	80,772	322,640
Soapstone, short tons	22,183	354,065
Precious stones		97,050
Pyrites, long tons	115,483	320,163
Corundum and emery, short tons	2,120	113,246
Oilstones, etc., pounds		127,098
Mica, pounds		57,041
Barytes (crude), long tons	17,668	46,513
Bromine, pounds	546,580	144,501
Fluorspar, short tons	6,500	52,000
Feldspar, long tons	7 614	30,700
Manganese ore, long tons	7,000	50,000
Flint, long tons	12,274	21,078
Monazite, pounds	1,800,000	160,000
Graphite, pounds		48,460
Bauxite, long tons	18,364	47,338
Sulphur, short tons	5,260	87,200
Fullers earth, short tons	9,872	59,360
Marls, short tons	60,000	30,000
Infusorial earth, short tons		16,042
Millstones		22,567
Chromic iron ore, long tons	786	6,667
Cobalt oxide, pounds	10,700	15,301
Magnesite, short tons	1,500	11,000
Asbestos, short tons	504	6,100
Rutile, pounds	100	350
Ozocerite, refined, pounds	(*none.*)	(*none.*)
Total value of nonmetallic mineral products		$332,566,616
Total value of metallic products		277,944,084
Estimated value of mineral products unspecified		1,000,000
Grand Total		$611,510,700

THE TIN PLATE MARKET.

The slightly improved demand noted last week has continued and is more especially noticeable through the Central West, where many of the large consumers are inquiring for plates for delivery through the balance of the year, and in some cases through the first quarter of 1898. There has been a slight weakening of prices for the later deliveries, owing to the fact that the so-called gentleman's agreement among the makers has been abandoned and the market has become an open one. But to counteract this the steel situation is stronger and the possibility of increased labor cost makes the mills slow to sell far-off futures.

The market for spot plates is decidedly firm. Many of the mills are behind with their deliveries for June, and it is generally conceded that a shut-down is probable in July, which will have the effect of strengthening the market for those months and probably for later months as well. The prices now ruling for deliveries between the Hudson and Mississippi rivers are as follows, for August to December deliveries:

	IC	IX
CHARCOAL TINS.		
Lisvane Grade,	$4.05	$4.80
Calland Grade,	4.25	5.00
COKE TINS.		
Full weight, basis weight,		$3.30
100 lb. " "		3.20
95 lb. " "		3.15
90 lb. " "		3.10
85 lb. " "		3.07½
80 lb. " "		3.05
TERNES.		
Full weight, 14 x 20		$3.22½
20 x 28		6.45
100 lb., 14 x 20		3.12½
20 x 28		6.25

Black plate, per 100 lbs., $2.30.

The prices for spot plates and July delivery may be quoted fully 15c per box over the figures mentioned above.

Foreign plates are considerably stronger, and it is reported that 200 out of 300 Welsh mills are being closed down. The result is that prices for all grades are advancing and what Welsh plates are used in this country are bringing a very good figure. We quote as follows certain grades of imported plates, f.o.b. New York:

CHARCOALS.		
Melvyn Grade, imported f. o. b. New York,	IC	$4.62½
Grange " " " "	IC	4.00
Allaway " " " "	IC	4.00
CHARCOAL TERNES.		
M. F., 20 x 28, imported f. o. b. New York,		$12.00
Worcester, " " "		8.25
WASTER TERNES.		
Alyn Grade, imported f.o.b. New York,		$6.20
COKE TINS.		
Bessemer, IC 14 x 20, imported f.o.b. New York	IC	$3.95
" " " " " "	100 lb.,	3.75
" " " " " "	90 lb,	3.50
Siemens squares,	IC basis,	4.05
" " " " "	100 "	3.85

The wage conference held in Pittsburg on Wednesday and Thursday last brought no results. The men represented by their conference committee, M. M. Garland, chairman, contended that their demand for an advance of 15 per cent must be granted. On the other hand, the makers' conference committee, George Greer, chairman, insisted that market conditions are such that an increased labor cost, at this time, is out of the question. After a session lasting over both days it was agreed to disagree and the matter stands just where it did before the conference, each side stating that it is impossible to recede from the position now taken. Unless some compromise is effected all of the mills will shut down July 1. It is understood that the makers, at their meeting in Pittsburg, unanimously decided to refuse the demand and close down all their plants, if necessary.

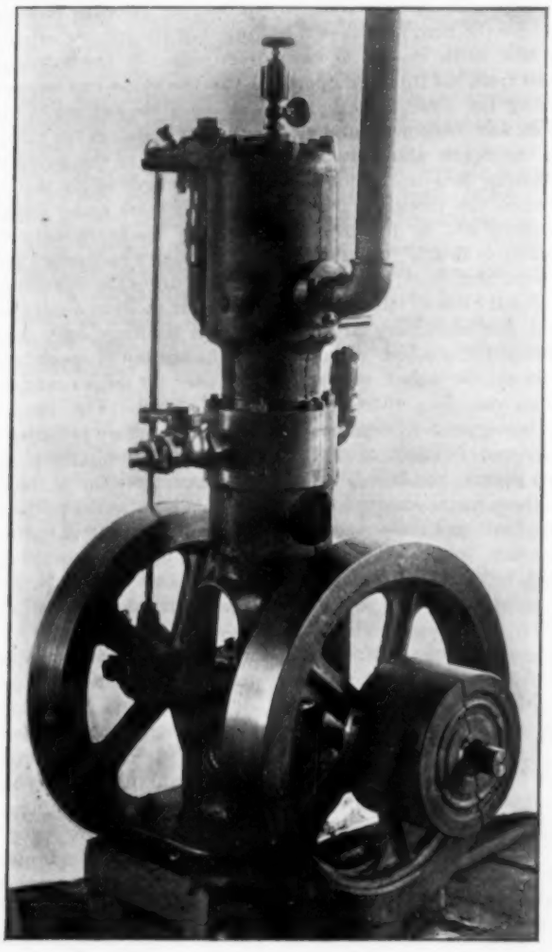
At the next meeting of the Pittsburg Foundrymen's Association, next Monday evening, Thos. D. West will read a paper on "The Comparative Fusibility of Foundry Irons, as Related to the Process of Charging."

The Republic Iron Works, Pittsburg, resumed Tuesday morning in all departments except the 14-inch mill and the puddling furnaces.

THE MAXWELL GAS ENGINE.

The plant of the old Keystone Plow Co., of New Castle, Pa., has passed into the hands of the recently organized Maxwell Mfg. Co., of New Castle, which has been formed to manufacture improved gas engines after the design invented by S. E. Maxwell. Mr. Maxwell is general manager of the new company. The property is well adapted for the purposes intended. A two-story substantial brick building, well equipped with machinery, meets every requirement of a machine shop. Accompanying this is the foundry, equipped with a steel furnace as well as a cupola. The foundry is supplied with jib cranes and is now being put in shape to make the needed castings for gas engines.

The Maxwell engine differs in a number of respects from engines already on the market. As will be seen from the accompanying illustration, simplicity is a conspicuous feature of the engine and its workings will be readily understood. It is equipped with a single cylinder, so designed that a steam



engine can be converted into a gas engine by substituting for its steam cylinder the Maxwell gas cylinder and the other parts of the steam engine may be retained in use. No time valves other than the piston are in use in the engine. The gas and air valves enter the cylinder at the bottom and the mixed gas and air is admitted to the upper part of the cylinder through ports in the plunger. These ports are open only when the piston is in a certain position. A positive explosion is had at every revolution.

The up stroke of the plunger draws in a charge of gas and air. The force of the explosion above drives the piston to the lower part of the cylinder, thereby compressing the gas already drawn into the lower part. When the piston reaches its lowest point the exhaust is opened and the products of combustion escape. At the same time the ports in the piston register with the opening into the upper part of the cylinder and the compressed gas and air rush from the lower part of the cylinder to the upper part.

By permitting the gas to thus enter the top of the cylinder and the products of combustion to escape at the bottom, the cylinder is emptied of one and filled with the other very quickly, as must necessarily be the case when the engine is running at a high speed. The exhaust and the inlets for gas and air are so arranged that they are opened and closed to the upper end of the cylinder at substantially the same instant, thus permitting the inflowing gas to assist in clearing the cylinder of the products of combustion. By having the gas compressed in the lower part of the cylinder it rushes instantly into the upper part of the cylinder as soon as the port in the piston registers with the port in the cylinder. The efficiency of the engine is thus automatically insured.

COKE IRON THAT CHILLED.

Mr. Edmund C. Pechin makes this interesting contribution to the *Tradesman*, as part of a discussion as to the respective merits of charcoal and coke irons for chilled work:

A curious incident happened in my furnace practice away back in the early seventies, at Dunbar, Pa., and which this discussion recalls. The furnace was an old-timer, 60 x 16 feet, with cast iron stoves, giving us from 900 to 950 degrees. We were running on forge iron, on a mixture of seven-eighths calcined carbonates and one-eighth magnetic, with Connellsville coke, which mixture gave a neutral iron. As often happened in those days the furnace got hot, and swung off on open foundry iron. When casting, the tapping hole clay came away, and the rush of iron overflowed the pig molds and tied all the pigs together on top and to the sow. This iron could only be broken into large masses, which, with difficulty, was gotten out of the cast house to the shop. It broke with difficulty, being unusually tough, tearing apart rather than breaking, with a fracture, showing very large graphite crystals. As it was not in a shape for market it was set aside for use in our own foundry. Shortly afterwards we needed some small wheels for cars in our ore mines, to run over light rail and wood, and some of this iron was used. The founder came to me, saying that the iron had given a heavy chill, fully as heavy as that of cold blast charcoal iron. I thought this impossible, but as the wheels showed a full and regular chill, I ordered a new melt of this iron, carefully watching every step myself, and had precisely the same result. This seemed to me so curious that I sent a sample to a then noted chemist for analysis. In his reply he asked me how this iron was made, as it was the most extraordinary that had ever come under his notice, and that he had placed a piece under a glass case in his office, where I saw it several years afterwards.

The pig carried nearly 96 per cent of iron, over 3 per cent of graphitic carbon, only a trace of combined carbon and sulphur; phosphorus .4 per cent and silicon .45 per cent. We had two casts of this iron when the furnace went back on forge.

Of course, this was the result of a furnace freak—such a product was never had before or afterwards, as far as I know. I would not know how to go about making such an iron, but one thing was certain, that this hot blast coke iron, with its carbon wholly graphitic, but with less than one-half of 1 per cent of silicon, gave as heavy a chill as could be had with the best cold blast charcoal iron. At the time I talked the matter over with a good many makers of both coke and charcoal irons. As in those days it was generally conceded that low silicon was the essential requisite to obtain a chill, the low silicon was all right, but the presence of so much graphitic carbon and the open face knocked them out.

Those who knew Mr. John L. Gill, Jr., for years a wheelmaker at Pittsburg, will recall that he maintained that he had found an intermediate form of carbon, which he thought largely influenced the chilling properties of iron. He gave large attention to this subject for a time, and as I remember read a paper on it, but nothing further seems to have resulted. It would have been interesting to have had this iron pass under his examination, but it was made several years before he announced his theory. I only want to make this point, that hot blast coke iron, without combined carbon, but with low silicon, has given as heavy and as regular a chill as the best cold blast charcoal. Whether any coke furnace can and will make such an iron on a commercial scale is an entirely different question.

TWIST DRILL GRINDING APPARATUS.

A portable apparatus designed for grinding twist drills accurately, and so constructed that it may be attached to emery grinders or grindstones, is shown in the illustrations given herewith The impossibility of grinding drills correctly by hand has been too well demonstrated, with results more costly than the special and elaborate twist drill grinders, which the device shown is calculated to replace. The apparatus, as may be inferred from Fig. 1, can be clamped to an emery grinder. Fig. 2 shows that if desired the device might be clamped to a board, with an emery wheel in proper position

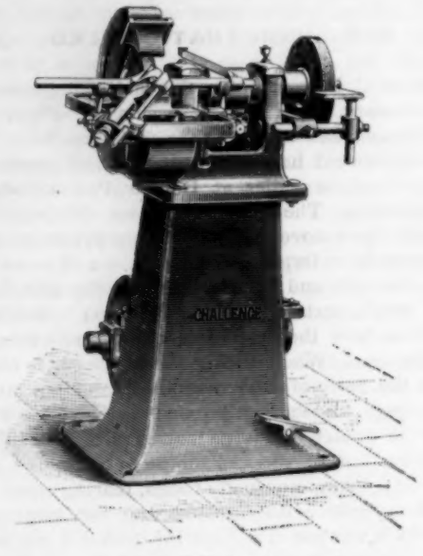


FIG. 1.

for grinding. It is stated that exactness of adjustment is not required in the position of the clamps relative to each other, nor in their distance from the wheel. The V-rests shown are adjustable vertically and horizontally but exact adjustment of their height is not essential. The drill holding bar may be lifted out of the rests when not in use and the wheel used for other grinding. In operation, the drill is moved forward or backward by turning the binding screw on the supporting rod, until the point of the drill touches the gauge at a mark

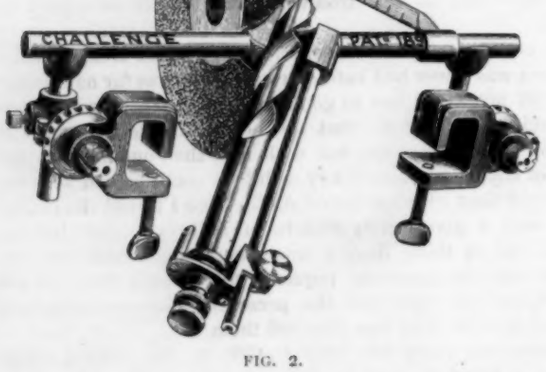


FIG. 2.

corresponding to the diameter of the drill. The device is then oscillated in the V's and moved clear across the face of the wheel. Then turning the drill over, the other lip is ground in the same way, perfectly even lips being secured. But a single screw nut, which is seen in the clamps, needs to be operated to advance the drill for a second cut. In grinding flat drills, the oscillating movement is omitted. The apparatus is made in four sizes, grinding drills from 0 to 2 inches. Each size will carry any length special drill by lengthening the rod supporting the shank.

The manufacturers are the Appleton Mfg. Co., 30th and Thompson streets, Philadelphia.

ALUMINUM, MANGANESE AND SILICON IN THE BRASS FOUNDRY.*

BY F. J. DAVIS.

It is only of late years that aluminum, manganese and silicon have come into use in some of the brass foundries, and in many of them they are still unknown. A greater familiarity with these metals would no doubt prove advantageous and be a source of profit to many of the foundries. So much has already been written regarding aluminum and aluminum bronze that most of the brass foundries are familiar wth the pure metal and one or two of the alloys. Some of them, after two or three failures to obtain a good casting of the bronze, have discarded the metal in disgust. Copper, with the addition of from 10 to 11 per cent of aluminum, is undoubtedly the strongest metal known, also one of the most difficult to cast. This difficulty is due to the great shrinkage of the metal and to the fact that a thin film of aluminum oxide forms on the surface of the molten bronze when it is exposed to the air, and shows up in the casting as so much dirt or dross. The shrinkage can be overcome by providing risers or feeding heads for the heavy parts of a casting, but the trouble arising from the oxide is not so easily overcome. If the bronze is poured from the lip of an open crucible the oxide can be seen entering the mold, appearing as a skin on the surface of the stream, and becomes entangled with the metal in the mold, with the result above stated. The presence of the oxide in the casting does not seem to affect the strength of the metal, but when the casting is used for hydraulic work under steam pressure it will be found to leak wherever the surface shows the oxide or dross. Casting the bronze from a secondary pot set over the mold, drawing the metal from the bottom of same, will prevent the oxide entering the mold to any great extent, and some very large and perfect castings have been made by that method. The hole in the bottom of secondary pot should be about one inch in diameter for large castings, with an iron plug fitting same perfectly tight. The bronze after being poured from the crucible into secondary pot should be allowed to stand a short time before pulling the plug, which permits the dross in the bronze to come to the surface, only clean metal entering the mold. This plan works perfectly for casting billets and bars for wire drawing and rolling into sheet. Iron molds should be used for this purpose; they should be perfectly clean and heated nearly red hot before the metal is allowed to enter. No wash is necessary or advisable.

A great many castings sold as aluminum bronze are in reality ordinary brass containing perhaps one-half or one per cent of aluminum. While the addition of this amount of aluminum to brass greatly increases the strength, hardness and fluidity of the metal, it is not true aluminum bronze, which is the two part alloy of copper and aluminum, varying in composition from 2 per cent to 11 per cent of aluminum; 11½ per cent of aluminum in copper is about the limit; beyond that the alloy is brittle. The strongest grade of the bronze contains 11 per cent of aluminum, and has a tensile strength of from 80,000 to 90,000 pounds per square inch, with a high elastic limit; it is not, however, very ductile, a test bar showing only about 5 per cent elongation in one inch. The presence of silicon in the bronze increases its strength and hardness, but decreases its ductility. An alloy of 3.50 per cent aluminum, 33⅓ per cent zinc and balance copper makes the best and strongest grade of aluminum bronze. It has a tensile strength of from 75,000 to 85,000 pounds per square inch, and is, of course, considerably cheaper than the 10 per cent aluminum bronze.

Silicon.

As a flux or reducing agent to the oxide of copper that is produced when copper is in a molten condition, silicon is more active in clarifying, refining and strengthening copper and its alloys of brass or bronze than aluminum or phosphorus. It has been found upon experiment that the addition of only one-tenth of 1 per cent of silicon to melted copper before pouring will make the bath more fluid, removes the oxide of copper, makes the castings clean and solid and entirely free from blow-holes. By the use of silicon in this manner diffi-

*Read at the Convention of the American Foundrymen's Association at Detroit, May, 1897.

cult and complicated castings can be made from pure lake or electrolytic copper. Where difficulty is experienced in obtaining solid castings from some of the brass and tin bronze mixtures, the addition of a very small amount of silicon will remedy the difficulty. In the two-part alloys of silicon and copper, 1 per cent of silicon will go as far as 2 per cent of aluminum in hardening and stiffening copper, that is, an alloy of 95 per cent copper and 5 per cent silicon, known as silicon bronze, is as hard and stiff as an alloy of 90 per cent copper and 10 per cent aluminum, and while perhpas silicon bronze will not resist corrosion as well as aluminum bronze it is a much better casting metal. It is also valuable for castings subjected to steam or water pressure as it is a very dense and close-grained metal. The 5 per cent silicon bronze has also been used very successfully for casting large vats in which a solution of caustic soda is used, the metal resisting the action of the caustic soda much better than any of several other metals tested. The most useful of the silicon bronzes are the 3 per cent (97 per cent copper, 3 per cent silicon) and the 5 per cent (95 per cent copper, 5 per cent silicon), although the hardness and strength of the alloy can be increased or decreased at will by increasing or decreasing the percentage of contained silicon. A 3 per cent silicon bronze has a tensile strength, in a casting, of about 55,000 pounds per square inch and from 50 to 60 per cent ductility; it is valuable where a tough and ductile metal is required.

The 5 per cent silicon bronze has a tensile strength of about 75,000 pounds per square inch and about 8 per cent ductility, making a very strong and tough metal. More than 5 or 5½ per cent of silicon in copper makes a brittle alloy. In using silicon, either as a flux or for making silicon bronze, the rich alloy of silicon and copper which is now on the market should be used. It should be free from iron and other metals if the best results are to be obtained. Ferro-silicon is not suitable for use in copper or bronze mixtures.

Manganese Bronze.

In much of the manganese bronze used by foundrymen in this country the manganese is added in the shape of ferro-manganese, which necessarily introduces considerable iron into the bronze. There is no doubt that this iron is injurious, and that the bronze so made is much more readily corroded and not nearly so strong, tough and ductile as bronze that does not contain iron. A rich alloy of manganese and copper, containing no iron or other impurities, is now on the market, and by using this alloy a very pure manganese bronze of any desired grade can be produced. One of the best and cheapest bronzes can be made after the following formula:

Copper	53.00 per cent.
Zinc	42.00 per cent.
Manganese	3.75 per cent.
Aluminum	1.25 per cent.

This makes a very strong, tough metal, suitable for propeller wheels, gears and pinions, mining machinery, etc. As the bronze contains no iron, a much greater quantity of zinc can be added than when ferro-manganese is used without danger of making the metal brittle. In the above mixture it is quite important that the aluminum be present, as without it difficulty will be experienced in obtaining solid castings; in fact it is necessary to add a small amount of aluminum to all the manganese bronzes, as without it they will not cast solid, but no trouble is experienced in obtaining solid castings when a small amount is used. Manganese bronze in the form of sheets is used quite extensively for mining screens, as the acid mine waters have no action on it. For rolling into sheets, a mixture containing more copper and manganese and less zinc is used.

A substitute for german silver can be made by the use of manganese, the different metals and their proportions being as follows:

Copper	67.25 per cent.
Manganese	18.50 per cent.
Zinc	13.00 per cent.
Aluminum	1.25 per cent.

The color of this metal is very good, resembling german silver closely. It is fully as strong as the best german silver and has superior casting qualities, which will be appreciated by foundrymen who have experienced some of the difficulties in casting german silver. It does not corrode as readily as either german or nickel silver. A test of the electrical resistance of this metal shows its resistance to be nearly four times greater than that of german silver, and is therefore a matter of importance where a metal of very high electrical resistance is required.

HOW TO GET SOUTH AMERICAN TRADE.*

BY JOHN A. JOHNSON.

The European nations who do the leading business with Argentina, Uruguay and Brazil have established strong banks there, which it is evident must be of very great assistance in international trade. It is said that these banks are paying liberal dividends on the capital invested. A good, strong American bank with branches in the leading towns would unquestionably do a good business. Of course these banks are private enterprises. At the present time there must be exceptional opportunities for money making in exchange, as both Argentina and Brazil are cursed with irredeemable paper money which fluctuates greatly in value, and it is under such conditions that bankers thrive. That enterprising, plucky little republic of Uruguay has been wise enough to establish and adhere to a specie basis, a gold basis at that, and she will doubtless have her reward.

It is not my purpose to discuss the banking question, but simply to call attention to it. Our capitalists cannot be expected to embark in such enterprises, unless they can see more money in them than in home investments. It is for them to make their own investigations.

Means of Communication.

One of the most striking comments on our means of communication with the countries of Brazil, Uruguay and Argentina is a statement of the fact that our mails go, on the average, quicker via Europe than they do direct, though the European route is between 3,000 and 4,000 miles longer, and that by either route the mails go under foreign flags, with the exception of what may go by the American line to England. The New York and South American lines, and there are several of them, are foreign concerns.

What we must do is to follow the example of other nations who are successful in building up foreign trade. Our competitors pay large subsidies to steamship companies to establish and maintain reliable steam communication between the countries with which they desire to have trade relations of their own. All the leading lines across the North Atlantic get subsidies from their governments, and all are foreign, except the single American line. All the leading lines between Europe and South America get subsidies or government aid in some form.

Soon after the English Cunard line was started, the American Collins line was also started, and was proving itself the stronger of the two, when the British government rushed to the aid of the Cunard line with grants of money. The Collins line received some temporary aid from Congress, but the demagogues argued that if the Collins line could not maintain itself against the Cunard line backed by the English government, let it die, and it did die. Other English lines followed the Cunard. Then came German and French lines, likewise subsidized. And so well does the system work that they not only subsidize North American lines, but also West Indian, South American, Australian, African and Asian lines. The subsidies are granted for the ostensible purpose either of having the government have the right to use the vessels in case of war, or of carrying mails, but in reality to establish trade. When a steamship gets a subsidy it can afford to carry freight and passengers at a low figure. I was told by a captain of a steamer of one of those subsidized lines that he was perfectly willing to carry coffee from Rio de Janeiro to England for four shillings ($1) per ton, and it is carried as low as two shillings (50 cents) per ton. Now a fair rate on coal from England to Rio is 15 shillings per ton. Coal can be carried in almost any kind of vessel, sailing or steamer, in which loading or unloading would not take too much time.

In reality it makes little difference to the people of England whether they pay freight on coffee to the steamship in the

*From a pamphlet on "South America; Its Resources and Possibilities," by John A. Johnson, president of the Fuller & Johnson Mfg. Co. and of the Gisholt Machine Co., of Madison, Wis. Mr. Johnson visited South America in 1896 as a member of the party sent by the National Association of Manufacturers of the United States. Copies of his pamphlet may be obtained by addressing him.

way of subsidy or direct. But it promotes trade. Quick and reliable means of communication induce personal intercourse. People visit one another to see whether trades can be arranged that will be mutually profitable. It can readily be seen what advantage Europe has over us in this respect.

Must Have a Steamship Line of Our Own.

Our total trade with the three South American countries named was, in 1894, over $112,000,000. Take the freight on this amount of goods and add thereto the receipts for passengers and mail transportation and it will be seen that there is no small income from our own business. South America does none of this business, and we do but a trifle. It is practically all done for us in foreign vessels.

It may be argued that if business is done by the carriers at a loss, let the foreigners have it. But Europe does not subsidize lines between North and South America that would not promote her trade. Hence our business has to pay its own way, and for that reason freights are much higher between North and South America than between Europe and South America, though the distance is about the same.

What we want is an American steamship line to promote American interests. Grant that it will run at a loss for a time. It will reduce the freights and therefore cheapen our coffee, sugar, hides and rubber. It will pay the money to our own people and keep it in circulation at home. It will pay wages to workmen to build ships and to man them. It will induce some of our people to visit South America instead of Europe for health, pleasure and business, thus again patronizing our own institutions. It will increase the sale of our products, thus increasing our national income and contribute to the payment of our foreign indebtedness and to making us independent of foreign capital.

Moreover, such steamers may be so built that they will answer admirably as tenders and commerce destroyers in case of war, and they will be ready for immediate service with trained crews. It is much wiser and more economical to expend a reasonable sum on a commercial fleet that may be ready in case of war than to expend all that might be available on the war fleet. England owes very much of her naval strength to her great merchant navy and trained seamen. The merchantman, besides being at all times ready as transports, are also quickly convertible into direct fighting auxiliaries. By all means build up our merchant navy, even if the main purpose be to strengthen our war navy.

Such steamers need not be very large nor very fast. They should be about like those in service between Europe and South America, say about 5,000 tons and speed about 15 knots. Bi-weekly service would be sufficient at least to begin with.

The subsidy should not be extravagant, but must not be niggardly. It should be remembered that the ships must run at a loss for a time. There should be a proviso similar to that of the English, which is that all earnings in excess of eight per cent interest must go to the government. A better plan is that all earnings over six per cent be equally divided between the company and the government.

Subsidies Not Confined to One Line.

The government aid should not be confined to a line between North and South America. There should be lines to the Mediterranean and South Africa at least. American wares ought to find their way to both these markets. It is probable that an annual expenditure of about $10,000,000 would be sufficient, certainly to begin with.

Under our earlier navigation laws foreign goods imported in American built vessels sailing under the American flag paid 10 per cent less duty than goods imported under foreign flags. Under that law, very few dutiable goods were imported under any but the American flag. It operated as a great incentive to the upbuilding of our merchant marine. This, in connection with the excellence and abundance of timber for shipbuilding, soon made us in proportion to population the foremost naval nation in the world, and in the war of 1812-14 we were able to cope with England herself on the high seas.

For some unaccountable reason, the law giving the 10 per cent rebate of duties was repealed. It was argued that if our shipbuilding interests could not live without having such advantage, let them die. Then came the foreign steamships with their subsidies, while ours had none. Then came the iron ship, which gave the advantage in materials as well as that of the cost of labor to the foreigner, and the result was death to our shipping.

American Shipping Must Be Revived.

It is idle to talk about our manufacturers seeking a foreign market without a revival of American shipping. Commerce does follow the flag. When there is no American flag to follow, it will follow some other flag. The consumer does not now have to hunt the producer. The producer must seek the consumer. It will not do to argue that the American manufacturer can get plenty of foreign ships to carry his goods to foreign market. He can. But the foreign ship owner invariably carries the foreign goods first, and he carries the seeker for purchasers for foreign goods first.

When our manufacturer gets there, he finds the foreigner established. He finds trade connections made and the markets supplied. He can get in only by underselling, and that means that the goods must cost him less than they do the foreigner.

Give the American manufacturer good and reliable means of communication, and at least an equal chance in the way of freights, and he is willing to undertake to enter the foreign markets. He will spend time and money to do it if there is any promise of ultimate results. But it is useless to spend money in a field and under circumstances where failure is inevitable. I have tried to show that notwithstanding our higher rates of interest and greater cost of labor, our manufacturers, because of some other advantages, may enter the field with the foreign competitor in many lines of production with reasonable hope of fair success. But if, in addition to his other disadvantages, is to be added that of bad communication and costlier freights, the task is a hopeless one.

Reciprocity.

I have not laid much stress on what may be expected from reciprocity treaties. Yet this is a feature that the government must not neglect. Certainly trade agreements may be made with a nation that will result in a benefit to both parties. Those having our trade relations in charge should always be on the alert to make such agreements. Our diplomats should be selected because of their knowledge and skill in commercial affairs. It is with men of such calibre they will have to negotiate. Then when opportunities present themselves for mutually profitable reciprocity arrangements, by all means make them. Through them some results have come and others will come. We are to attempt to enter foreign markets with able, shrewd, wealthy, experienced competitors. We have no holiday task before us. To wrest even a portion of the market away from those in possession involves a tussle with industrial giants. We must neglect no opportunities, omit no rational means of success.

The Railroad Improvement.

The railroad gross earnings for May fulfill the promise of the first weeks of the month, and 131 roads, as reported by the *Chronicle*, show an increase of $1,942,782 as compared with last year, or 5.14 per cent. Nine roads out of the list show increases in gross of over $100,000 and 23 show more than $30,000. The greatest gain is on the Mexican Central, $289,000. The Canadian Pacific follows with $223,000, then the Missouri Pacific with $195,000, Great Northern with $188,000, the Illinois Central with $150,000, Kansas City, Pittsburg & Gulf with $140,000, Mexican National with $127,000, New York Central with $104,000 and the Chicago, Milwaukee & St. Paul with $102,000. The Southern, the Louisville & Nashville, Northern Pacific and the Texas Pacific all show substantial gains of upward of $68,000. The grain movement was quite heavy. The receipts of all cereals at the Western primary markets aggregated 37,613,000 bushels against 26,091,000 the year before. The live stock movement into Chicago was a trifle less than the year before, but the receipts of live hogs at that point were larger than in any recent year, aggregating 729,748 head.—[Railroad Gazette.

H. S. Vrooman, who has been connected with the Garden City Sand Co., of Chicago, as salesman for a number of years, has gone into business for himself, at 220 W. 20th street, Chicago, carrying a line of fire brick, fire clay, molding sand and core sand.

ELECTRICAL EQUIPMENT FOR FACTORIES.—II.*

BY DOUGALD C. JACKSON, MADISON, WIS.

The possible savings are discussed below under the respective headings belonging to the following divisions of

B.—COMPARATIVE OPERATING ADVANTAGES.

1 and 2. *Annual Expense for Fuel and Attendance.*—The following quotation from an editorial item which appeared in one of the technical journals nearly two years ago, puts the argument upon these points which favors electrical power:

"It is perfectly clear that Messrs. ——— have derived to the fullest extent the great advantages offered by electric transmission; they have saved valuable spaces formerly occupied by steam engines, and they have abolished to a great extent the losses due to mechanical transmission. The concentration of the whole of the steam plant in one compact space has led to great saving in labor, the majority of the men who formerly attended to the scattered steam plant being drafted into other work. It should also be pointed out that large compound and condensing engines are used with consequent economy. The central station which supplies the power has a capacity of 1,500 horse power. . . ."

"At the ——— mills there will doubtless be a gradual but complete abandonment of isolated steam plants, for the proprietors are completely alive to the manifold advantages of concentrating steam raisers. It is yet too early to expect detailed costs of working, but there appears to be the greatest satisfaction with the general performance of the electric machinery and a settled conviction that it is the only system which can efficiently supply power to scattered buildings."

This argument seems to be well supported by experience in great manufacturing establishments where hundreds or even thousands of horse power must be distributed over a considerable area. In the establishments of less magnitude, such, for instance, as use not exceeding 250 horse power, it is questionable whether any very large fuel saving can be shown by the electrical plant under ordinary conditions, and certainly no appreciable labor saving can be shown in the power plant. These deductions are supported by reference to the experience of a considerable number of manufacturing establishments, the names of which are in most cases synonymous with success. I regret that I have not been able to make tests on any plant by which I could directly and exactly determine the saving in idle-power losses which is effected by changing from shaft and belt to electric transmission. I have many records of the loss in power caused by shafts and belts, and several manufacturers have been good enough to give me records of idle losses in their electrical transmissions. A comparison of the records bears out the ordinary contention, which has a firm inductive foundation that the idle losses are very much less with electrical transmissions. This gives the latter a decided advantage over main shafts and belts, on the score of economy, when a shop is run with portions shut down.

3 and 4. *Annual Expense for Repairs, and Frequency and Extent of Failures.*—Experience upon the relative expense for repairs upon electrical and mechanical transmission, and the relative extent and duration of breakdowns occurring with the two systems of transmission, is remarkably favorable to the electrical transmission.

Summing up the general opinion in regard to the above four points which is held in manufacturing establishments which are using electric power, it is safe to say that there is an overwhelming feeling in favor of the use of electrical transmission in preference to the various forms of mechanical transmission on the combined score of economy of operation and a reduced annoyance and expense through delays caused by failure of transmission apparatus.

This statement is based upon information which I have obtained from tests or which has been given me, directly or through correspondence, by a very considerable number of establishments. Quotations taken from my correspondence to show the feeling of experienced users of electric power are given in my original paper, my choice of letters from which to make quotations being determined by the extent of the electrical experience upon which information given me was founded and the fulness of the information, but I will omit the quotations here. Few establishments have records from which comparative figures can be obtained, and those which have such figures are seldom willing to have them publicly quoted, but the quotations which I made show, in a general way, the results which have been obtained. In nearly every case for which I have exact figures a sufficient direct saving is shown to be effected by the electrical transmission to make large returns on its greater first cost.

5 and 6. *Convenience.*—Omitting quotations and summing up in regard to points 5 and 6, as before, it is the nearly universal experience in establishments turning out a product of bulky or heavy articles that the electrical equipment adds materially to the shop efficiency, a result which seems to be principally due to the convenience which it lends to the arrangement of tools and handling the work from overhead; this not only saves time in itself, but it also leads the workmen to give better service. In establishments where the product is in small articles, and articles which must be handled in a fixed manner, and where cleanliness is important, the electrical equipment adds to the shop efficiency more largely through cleanliness. The latter may be a matter of much importance, but ordinarily it is less important than is the question of convenience to the manufacturer of heavy or bulky articles. The floor space which can be saved by the use of electrical transmission through a better arrangement of machinery is also much greater in the case of establishments turning out bulky or heavy articles.

7. *Safety.*—The superior position of the electrical transmission with respect to the safety of workmen is evident, and it is not advisable to prolong this paper by entering into a discussion of it here. In regard to the question of fire risk, it is general experiencence that an electrical plant properly installed is perfectly safe.

8. *Cleanliness.*—This point has been sufficiently touched upon just above.

The experience taken as a whole in all the establishments from which I have been fortunate enough to receive information shows that for plants using not less than 100 horse power the electrical transmission is so much more satisfactory and economical that it is a misfortune for a new manufacturing plant, except under very exceptional conditions, to be constructed with any type of transmission except the electric. It is to be understood that the electric equipment should be such that crane motors can be operated from the generators and transmission wires which are laid down for the regular factory power distribution, and, for the best results, the generator should also be adapted to the purpose of factory lighting. These conditions are fulfilled by either a 220-volt continuous-current system, using compound-wound generators, or by a properly designed polyphase alternating-current system. In the average manufacturing establishment the former seems to promise the best results, though more experience with the latter may prove it to give equally satisfactory results. The 220-volt continuous-current plant allows the use of 220-volt incandescent lamps connected directly between the positive and negative transmission wires, or arc lamps may be used in sets of four.

The status of electrical transmission in plants already built and equipped with mechanical transmission is more complex. Establishments which turn out heavy products, such as locomotive works, engine works, boiler works, machine-tool works, iron mills, etc., profit so much by electrical cranes that an electric plant is an invaluable accessory. It is then a natural step to do away with countershafts and belts running to the larger tools, which may be equipped for driving by electric motors and placed in more convenient positions with reference to handling the product. This change commonly results in a large reduction of the cost of manufacturing, and if carried out with caution and judgment is invariably satisfactory. A somewhat similar condition exists in establishments which turn out a bulky product, such as agricultural works, carriage works, etc. The convenient arrangement of machinery which may be gained by using electric motors adds materially to the product that can be put through such a shop, or largely reduces the transmission losses caused by quarter-turn belts, bevel gearing, etc. In the case of a plant of this type, upon which careful and complete tests have lately been made by two of my students, it is shown that the

*Read at the Hartford meeting (May, 1897) of the American Society of Mechanical Engineers.

actual saving of power, attendance, and repairs now lost in great quarter-turn belts and other features usual in the mechanical transmission system of a somewhat scattered agricultural works, would nearly pay the annual sum necessary to cause a change of the old system into an electrical system to be profitable; while additional convenience in the location of tools, immunity from expensive stoppages due to injured belts, etc., and the advantages of satisfactory illumination gained from the power generator would give a large margin of profit upon the expense of putting in the electrical plant. Establishments which turn out a lighter and less bulky product gain less in convenience from the electric power, but there are numerous industries in which the cleanliness resulting from the suppression of shafts and belts is of the greatest moment. In these the electrical transmission may be made a great money saver, as is shown by the experience of its users.

There are many special conditions which make the adoption of electrical transmission of advantage in established industries where otherwise it would not pay to incur the expense involved in a change from an established mechanical transmission to a new electrical transmission. Thus, for instance, when an isolated building is located at some distance from the main building of the plant, the expense of operating a separate steam plant in that building, or of conveying power to the building by piping steam from the main plant, or by means of mechanical transmission, is often several times as great as the total annual cost of a complete electrical plant to be used for the purpose. In the total annual cost I include interest and depreciation, as well as fuel, attendance, and repairs. A number of cases of this kind have fallen under my observation.

Another case, in which the same result obtains, came under my observation recently. Here the establishment was a large one, with considerable transmission losses (equal to nearly 70 per cent of the average useful load), and a considerable economy in fuel, attendance and repairs would be effected by replacing the mechanical by an electrical transmission. The large expense involved justly deterred the proprietors of the plant from entering upon the change. The prime-power plant of the establishment is now found to be too small to carry the maximum load of the plant with late additions, while the reduced percentage of loss, incident in this case to the electrical transmission, would enable the engines to carry the load satisfactorily. The complete cost of a change to the electrical transmission is not greatly in excess of the cost which would be required in making the changes in the power plant which would be required for the purpose of adding an engine. These conditions being fully considered, and charging the excess cost, only, to the electrical transmission, the latter would make an annual saving in the cost of operating the works which would well repay for its installation. The electrical plant is here placed upon a basis which is quite near its position with respect to new establishments.

It is unnecessary to multiply similar instances, but I will summarize the entire question as follows:

1. In constructing new manufacturing plants, the extra first cost of a complete system of electrical transmission for the works is negligibly small (except under exceptionable circumstances) compared with the annual saving effected by its means when its advantages are properly utilized.

2. In certain industries the advantages of electrical transmission outweigh the first cost of making a change from mechanical to electrical transmission in established plants, while in many plants where this condition would not commonly exist the arrangement of buildings or the growth of the plant is frequently of a character with reference to the prime power plant which places electrical transmission upon an advantageous footing, either as an auxiliary to the main transmission or as a rival to the existing mechanical transmission.

There is one more important question which affects electrical transmission alone. That is the question of the subdivision of power at the machinery. Briefly, the following seems to be the general consensus of opinion among those who have operated plants with electrical power. All large tools or machines, such as use from five to seven and one-half horse power and over, should be supplied with individual motors, while smaller tools or machines requiring less power should be grouped and driven from motor-driven shafts. These groups should ordinarily be arranged so that a motor of not less than from three to five horse power capacity is required, and not more than from 10 to 15 horse power. The grouping of tools, the subdivision of power, and the manner of delivering power of motors to driven machinery, it may here be said, is a matter which can be given only the most general treatment as a whole, as each industry includes conditions of its own which must be taken into the count. Observation indicates that some manufacturers who are using electrical power failed to carefully weigh the question of its subdivision when preparing to install their plant, and have thereby lost much of the advantage which may be derived from the electrical transmission.

The subject is so intimately bound up with the question of shop economy that it is a very live one for manufacturers, and it is not yet exhausted of novel results; and I propose by another year, if possible, to gather from the records of certain plants which are more or less typical, and from which I may be able to derive the information, more exact data relating to the economies due to electrical power in manufacturing plants. In gathering together the data which form the foundation of this paper I was forced to extend my information by resort to correspondence, and in some cases did not receive much assistance. One of my most interesting letters, which came from a prominent manufacturing concern, contains the following reply to a request for information regarding the comparative expense and general advantages of shaft and belt or electrical transmission as deduced from the experience of the concern:

"In these days of active competition we do not feel it is wise to make public the savings or advantages derived by introducing various economies."

I have not been able to decide from this whether the experience of the writer of the letter has been favorable or unfavorable to electrical transmission. As a whole, however, my correspondence showed a unanimity of experience in favor of the electrical plant that is quite remarkable. It is to be distinctly remembered that I have dealt solely with the comparative advantages of transmitting agents operated by the same prime mover. Wherever electrical methods allow advantage to be taken simultaneously of the economies shown by experience to lie in the electrical distribution of power, and the economy due to the substitution of a water power, more or less distant, as prime agent, in place of a steam plant which is more expensive to operate, the electrical plant must prove a boon indeed to manufacturers.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The National Iron Co., of Duluth, Minn., has been incorporated by J. Evered, president; Walter Evered, vice-president, and Harry R. Armstrong, secretary and treasurer, to manufacture iron machinery and to do repair work.

The Vance Boiler Works Co., of Geneva, Ontario County, N. Y., has been incorporated. The capital stock is $15,000, and directors: James R. Vance, Stephen D. Parker, George W. Goodwin, William S. Moore, Barney Borgman and F. N. Squires, of Geneva, and James H. Haslett, of Waterloo.

The Long Mfg. Co. has been incorporated at Rochester, N. Y., with a capital stock of $1,000, to manufacture hardware specialties, by S. W. Long, Jenet Pennington and Abraham Benedict.

The Champion Saw & Gas Engine Co., of Beaver Falls, Pa., has applied for a charter. The new company is a reorganization of the Champion Saw Co., and the new feature of the business will be the manufacture of the gas engine designed by Mr. E. W. Bentley, of New Brighton. The incorporators are J. W. Forbes, J. D. McAnlis, R. M. Downey, E. W. Bentley, George S Hunter, J. A. Haller, William Pierce. R. M. Downey has been made president, J. W. Forbes, treasurer, and E. W. Bentley, secretary.

New Construction:—

The Atlantic & Pacific Railroad proposes building a new boiler shop at Albuquerque, Mex. It will be next to the company's machine shops and will be 62 x 162 feet. The stone

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WE .NVITE ATTENTION TO OUR COCHRANE HEATERS AND OUR COCHRANE SEPARATORS, APPLIANCES WHICH HAVE PROVEN PARTICULARLY WELL ADAPTED FOR STEAM POWER PLANTS IN THE IRON AND STEEL INDUSTRIES.
THEY ARE FOUNDED ON COMMON SENSE LINES, DO PRECISELY WHAT WE CLAIM FOR THEM, ARE SOLD ON THEIR MERITS AND AT PRICES COMMENSURATE WITH THE TIMES.

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for the foundation is now being brought from the Putnam quarries, near Albuquerque.

At West Newton, Pa., work on the proposed plant of the Hamilton Tin Plate Co. has begun.

Work has been begun on the new freight car shops of the Atchison, Topeka & Santa Fe, at Topeka, Kan. The new building, which will be 792 x 145 feet, will be east of the present shops at Topeka. The cost will be about $65,000.

The Birmingham Rolling Mill Co., Birmingham, Ala., have just placed an order for an additional 35-ton open-hearth basic furnace, which will be built at once. The furnace just completed will probably start up July 5.

Additions, Enlargements, Removals, Etc.:—

W. S. Yates, president of the Electric Specialty Co., of Pittsburg, has been in Youngstown, O., conferring with the board of commerce about moving to that city. He asked for ten acres of land near a railroad as a bonus, and said he would put up a plant to employ 100 men.

The Ohio River Sheet & Tin Plate Co., incorporated, manufacturer of sheet iron and black plate for tinning, with works at Remington, Pa., has completed an additional mill, giving the company a two-mill plant which is being operated to full capacity. The concern reports plenty of orders and expects to run full right along.

Some mention has been made heretore of the improvements under way at the Burgess Steel & Iron Works, Portsmouth, O. The company is adding an open-hearth basic steel furnace of 30 tons capacity and is also putting in a 28-inch blooming mill, which will enable it to make its own billets and slabs. Up to the present time the company has purchased its billets and slabs, but is of the opinion that the additional furnace will give it enough steel to take it out of the market for billets. The new blooming mill was built by the Frank-Kneeland Machine Co., of Pittsburg, and the reversing engines were furnished by Wm. Tod & Co., of Youngstown, O.

General Industrial Notes:—

The American Tin Plate Co., of Anderson, Ind., has had its lease canceled by Erastus Foote, Adrian Vanderkloot, W. D. Kent and Robert Vierling, of Chicago, constituting the directory of the Premier Steel Works, of Indianapolis. The tin plate company leased the plant on the condition that at the expiration of one year, if found not profitable, the same could be surrendered. The breaking of the pool and the reaction of steel billets from $22 to $14 made operation unprofitable, and the plant closed down some time ago. There is no immediate likelihood of a resumption.

The annual meeting of the Burden Iron Co., Troy, N. Y. was held Wednesday, June 16th, when trustees were chosen as follows: James A. Burden, I. Townsend Burden, John L. Arts, James A. Curden, Jr., Nicholas J. Gable. Subsequently the trustees elected officers: President, James A. Burden; general manager, John L. Arts; secretary, Nicholas J. Gable.

At the ordinary annual general meeting of the stockholders of Fraser & Chalmers, Ltd., held in London June 4, a dividend of 5 per cent was declared. The secretary's report said, in part: "You will notice with satisfaction that at last we have entered upon the dividend-paying stage again, and we will ask you presently to declare a dividend at the rate of 5 per cent. I think it wants some explanation that this amount is not higher, as our accounts show a result very much superior to the sum we are distributing. Our earnings during the year have been nearly £50,000, whereas we are distributing only between £15,000 and £16,000. The reasons are principally these, that, although our accounts show that we have had a favorable year, we are not exactly very flush of cash, and we always thought it was best in the interests of the shareholders to stand as much as possible upon our own resources, so that we should not have to borrow money when required. Another reason is the position of the American corporation, of which we are shareholders, as you know. It is true that we have done in America a larger business last year than we have done for several years preceding, but the conditions of trade in that country unfortunately are not favorable yet, and the profit earned has been an extremely small one, being only sufficient to meet the debenture interest and leave a small balance over. We have made several important changes of an expensive nature, and these have come out of the current expenditure; therefore, the position is really somewhat better than it appears from the accounts."

The business offices of the Pomeroy (O.) Iron Co., operating rolling and puddling mills at that point, have been removed to Columbus.

The Whitaker Iron Co., of Wheeling, W. Va., has put on three additional departments, and begun the work of transforming three sheet mills into tin plate mills. The puddle mill of the plant was started last week.

On a recent blast the Rebecca Furnace at Kittanning made a run of 201 tons of foundry, exceeding all its former records. This is considered good, as the furnace is a 65 x 16 feet, and is working about 25 per cent of native ore.

The day men employed by the Oliver Iron & Steel Co., at their Tenth street mill, Pittsburg, were reduced 10 per cent in wages last week.

The factory of the J. J. Norman Co., manufacturers of gas and gasoline engines at 58 to 62 Clinton street, Chicago, was closed June 18, on a levy by the sheriff on three judgments aggregating $8,642.79. The judgments were secured by Sophia Zempel, $3,239 41; Anna Wolf, $2,701.69, and Philomena Ruedebuse, $2 701.69, for money loaned the corporation. The company is managed by H. A. Lauson, president and treasurer, and J. J. Norman, secretary.

Work is to begin at once on the erection of another hot blast stove, 20 x 60 feet, at the furnace of the Roane Iron Company of Rockwood, Tenn.

The plant of the Marinette Iron Works Co., Marinette, Wis., has been sold to the American Sugar Machinery Co. The new company will manufacture sugar machinery and develop the beet sugar industry of the United States. The incorporators are Karl G. Korn, W. Boldzendahl and Chris. Heinrich, of Milwaukee. The capital stock is $1,000,000 in shares of $100 each. The company expects to begin operations in Marinette by July 1 and in 60 days will have the

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plant in operation. The main office and headquarters of the corporation are to be in Marinette. Foreign capital is interested. Some changes in the iron works plant will be made.

The report that the Aschman Steel Casting Co., of Sharon, Pa., had reduced wages 10 per cent is without foundation.

The C. H. Haeseler Co., Philadelphia, Pa., is furnishing a complete compressed air plant for the Newport News Ship Building & Dry Dock Co., consisting of a 20 x 24-inch duplex steam compressor, 24 pneumatic caulking and shipping tools and 15 pneumatic drills and reamers. This plant is said to be the largest of its kind in the country.

The National Tube Works Co., of McKeesport, Pa., which has successfully made 24-inch wrought iron pipe, will soon make pipe of the sizes 30 and 36-inch. The company has equipped the department in which these pipes will be made with new machinery.

The Elmira Iron & Steel Rolling Mill Co., of Elmira, N. Y., is in the hands of a receiver. The company recently put in a steel plant at an expense of $60,000.

A. B. Crinkley, of Harriman, Tenn., who recently purchased the Harriman Rolling Mills, will improve the plant preparatory to active work. It is stated that the mill will start non-union.

At Frankfort, Ky., the court of appeals has decided one branch of the old Fidelity National Bank case of Cincinnati, involving $581,000. The question was whether the creditors of the Fidelity bank or creditors of Swift's Iron & Steel Works at Newport should have $581,000 worth of the assets of the steel works. The court decides that the steel works drew the money from the bank by the order of Harper, who was president of both, and that Harper himself, president of the steel works, having received the money so drawn, the creditors of the bank must look to Harper and his bondsmen and not to the steel works for reimbursement, unless it can be proved that the steel works actually used the money in its business.

The plans for the new Rosena furnace have been furnished by Geo. W. McClure & Son, engineers and contractors, Carnegie Building, Pittsburg, Pa. The new stack will be 97½ feet high and diameter of bosh 20 feet.

Reports from Big Stone Gap, Va., say that there is considerable work in the way of repairs in progress at the plant of the Big Stone Gap Iron Co., now idle.

The product of the Dora Furnace Co.'s furnace at Pulaski, Va., last month surpasses all former records, reaching 5,488 tons, while in quality the iron is uniformly good.

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1—36-in. G. & E. Spur Gear Cutter.
2—Crank Planers.
3—No. 1 Brown & Sharpe Screw Machines.
2—No. 6 Brown & Sharpe Screw Machines.
1—36 in. Car-wheel Borer.
1—55-in. Pneumatic Riveter.
1—30-in. Pulley Lathe.
1—Pratt & Whitney Turret Lathe.
1—109 in. Engine Lathe.
1—15-in. Fox Turret Lathe.
1—20-in. Lodge-Davis Turret Lathe.
1—20-in. x 10-ft. Gleason Engine Lathe.
1—24-in. x 12-ft. Gleason Engine Lathe.
1—3-Spindle Drill Press.
2—30-in. Drill Presses.

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All business connected with the sale of the above brands of Charcoal Pig Iron will, from April 1st, 1897, be handled by THE SUPERIOR CHARCOAL IRON CO., of Detroit, Mich., which is thus enabled to supply the best iron known for all purposes, especially for Car Wheels, Malleable Castings, Boiler Tubes, Ship and Armor Plate, strong high Silicon for foundry purposes, Basic Pig Iron with the minimum of Silicon and Sulphur, also iron to take the place of Salisbury, Southern, and Swedish Charcoal Iron.

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The contract for the steel water pipe required to connect the new reservoir at Minneapolis, Minn., with the city mains has been let to the T. A. Gillespie Co., of Pittsburg, at $343,726, which is $3,000 above the original bid, to cover Eddy valves in preference to R. D. Wood & Co. valves.

Notice of a 10 per cent reduction in wages was posted some time ago at the Pennsylvania Steel Works, Steelton, Pa. The company notified the men June 19 that the old rate will be restored July 1.

No. 3 blast furnace of the Pennsylvania Steel Co., at Steelton, Pa., has been started up. The three furnaces of this concern are now in operation.

The Andrews & Hitchcock Iron Co.'s furnace in the Youngstown, O., district resumed last week. The Struthers furnace, the Andrews Bros. Co.'s and the Youngstown Steel Co. furnaces are reported to be preparing to go in blast.

The American Steel Casting Co., which owns plants at Norristown, Pittsburg, Sharon and Thurlow, Pa., Syracuse, N. Y., and Alliance, O., has chosen the following officers: President, Daniel Eagan, of Philadelphia, formerly of Sharon; vice-president, Wm. M. Wilson, of New York; secretary and treasurer, John W. Booth, Thurlow; directors, Daniel Eagan, Philadelphia; N. H. Larzelere, of Norristown; Wm. M. Wilson, of New York; Charles Travern, of Boston; F. H. Buhl, of Sharon; Robt. Wetherill, of Chester, and A. C. Wall, of Orange, N. J. A dividend of $1 on each share of preferred stock was declared.

The finishing department of the Reading Iron Works, Reading, Pa., employing over 100 hands, resumed, and it is likely that other departments will soon follow. It is predicted that the majority of the men idle because of the wage reduction will soon be at work, but puddlers refuse to accept a cut.

Ashland, Wis., furnace of the Ashland Iron & Steel Co., resumed last week after being banked for several weeks.

Anniston, Ala., rolling mills are still idle, with no immediate prospect of starting.

The Westinghouse Electric & Mfg. Co., of East Pittsburg, Pa., have received an order for four 800-kilowatt direct connected generators for the South Side Elevated Railway Co., of Chicago.

The Wais & Roos Punch & Shear Co., of Cincinnati, is building for delivery at Max Meadows, Va., a heavy combined punch and shear with engine, weighing about 44,000 pounds, equipped for cutting 5-inch axles cold, and for slitting plates and cutting up scrap, locomotive frames, etc. A duplicate of this machine goes to Geo. B. Douglas & Bro., of New York, for delivery at Bridgeport, Conn., with the addition of an arrangement for punching splice bars. The company also has under construction some tin pack shears for the Ellwood Tin Plate Co., of Ellwood City, Pa.

Riter & Conley, of Pittsburg, are building two nickel steel boilers for the W. A. Clark Co., on account of the Orford Copper Co., New York. The nickel steel plate was furnished by the Carbon Steel Co., of Pittsburg.

F. H. Bultman & Co., of Cleveland, announced that they have purchased the entire plant of the Superior Machine Co.,

including patents and patterns, and will continue to conduct the same general business as heretofore at the same place, 106 and 108 Canal street. In addition to gear cutting and building of gear cutting and special machines, they have provided a separate department for handling and repairing printing and stereotyping machinery.

A recent shipment of 50 tons of ferro-aluminum has been made by the Pittsburg Reduction Co., Pittsburg, to an iron foundry firm in St. Petersburg. The material was to be used in the manufacture of castings for the Russian Government. Ferro-aluminum consists of 90 parts iron and 10 parts pure aluminum. This 50 tons of ferro-aluminum was furnished by the Carbon Steel Co., of Pittsburg, the Pittsburg Reduction Co. furnishing the aluminum which entered into it.

The Jeffrey-Robinson coal washing system, which is manufactured by the Jeffrey Mfg. Co., of Columbus, O., is receiving much attention from coal operators. Its claims for superiority, efficiency and low cost of operation have been thoroughly demonstrated in the many plants now in use. Among recent orders for complete 400-ton washing plants are the following: Kansas & Texas Coal Co., mines at Huntington, Ark.; Muddy Valley Mining & Manufacturing Co., Hallidaysboro, Ill.; the Chickamauga Coal & Coke Co., Chickamauga, Ga., and the Toms Creek Coal & Coke Co., of Pulaski, Va.

SEASHORE EXCURSION.

Via Pennsylvania Lines This Summer.

General excursions to the seashore at exceptional low rates will be inaugurated by the Pennsylvania Lines this summer, offering grand opportunity for delightful outings at the most popular ocean resorts on the continent. This announcement will be good news to persons who may desire to enjoy their vacation at the seaside. They may visit Atlantic City, Cape May, Avalon, Sea Isle City, Anglesea, Ocean City, Holly Beach or Wildwood at very low fare, round trip tickets to either resort being obtainable at the same rate.

The first excursion will be run Thursday, July 15th, followed by a second four weeks later, Thursday, August 12th. Round trip rates to either Atlantic City, Cape May, Avalon, Sea Isle City, Anglesea, Ocean City, Wildwood or Holly Beach, New Jersey, will be $12.50 from Ft. Wayne and Toledo; $12 from Lima, Crestline, Tiffin, Mansfield; $11.50 from Orrville, Cleveland, Canton, Massillon, Youngstown, Girard, Niles; and $11 from Alliance.

The return limit will cover 12 days, including date of sale, which will be ample for customary ten days' vacation. For further desired information, address C. L. Kimball, Assistant General Passenger Agent, Cleveland, O., for particulars. Illustrated description of resorts to which excursion tickets will be sold, with list of hotels and boarding houses at each, will be furnished upon application.

THE life of tin, iron or steel roofs can be prolonged by painting them with Allen's Anti-Rust Paint. It costs little and lasts long. Address for particulars the Allen Anti-Rust Mfg. Co., 413 Vine street, Cincinnati.

FOURTH OF JULY EXCURSIONS.

Excursion tickets will be sold Saturday, Sunday and Monday, July 3d, 4th and 5th, from ticket stations on the Pennsylvania Lines west of Pittsburg to any station on those lines within 200 miles of selling point. Tickets for adults will not be sold for less than 25 cents, nor for children at less than 15 cents. Excursion tickets will be good returning up to and including Tuesday, July 6th. For details, apply to nearest Pennsylvania Line ticket agent.

TO CALIFORNIA.

Cheapest Rates Ever Offered.

Low rate tickets to San Francisco, California, will be sold via Pennsylvania Lines June 28th, 29th and 30th and July 1st, 2d and 3d, account the Christian Endeavor Convention. The rates will be exceedingly low, less than a single far one way, affording opportunity for visiting the Pacific Coast at the cheapest fare ever offered. Stop-overs and variable route privileges will permit of an enjoyable trip. Excursionists will have over a month in which to see the sights or visit friends, as the final return limit of tickets will be August 15th.

The very low rate is open to all, Christian Endeavorers, their friends and the public generally. The arrangements for these excursions make them the grandest chance for a delightfully interesting and instructive jaunt across the continent at small cost on tickets issued by the Standard Railway of America. That means a start over the most desirable route with choice of lines west of the Mississippi River gateways over which Pennsylvania Lines excursionists will receive all the comforts of a delightful journey. Consult the nearest

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All Sand Fully Guaranteed.

FOR SALE, CHEAP SECOND-HAND TOOLS.

5—14 ins. x 6 ft. Lathes. 2—14 ins. x 8 ft. Lathes. 3—16 ins. x 6 ft. Lathes. 1—10 ins. x 8 ft. Lathe. 2—18 ins. x 6 ft. Lathes. 6—18 ins. x 8 ft. Lathes 3—18 ins. x 10 ft. Lathes. 1—18 ins. x 12 ft. Lathe. 1—22 ins. x 12 ft. Lathe. 3—24 ins. x 12 ft. Lathes. 1—26 ins. x 12 ft. Lathe. 1—26 ins. x 14 ft. Lathe. 1—26 ins. x 16 ft. Lathe. 1—30 ins. x 12 ft. Lathe. 2—52 ins. Radial Drills. 2—80 ins. Radial Drills. 36 ins. x 36 ins. x 16 ft. Planer, Double Head.

All of these tools are the latest improved and just as good as new, and can be seen at our ware-rooms on Second Street, Cincinnati.

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DOES YOUR ROOF LEAK?

If an old leaky tin, iron or steel roof, paint it with Allen's Anti-Rust Japan. One coat is enough; no skill required; costs little; lasts long.

The name describes it; proof against water, time, climate, and fumes of every description. Stops leaks, and prolongs the life of an old roof.

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To be returned at our expense if not satisfactory.

This Anti-Rust is also of highest value in protecting metal pipes, fans, etc., at mines, exposed to the corroding effects of *mine air* and *mine water*.

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Ticket Agent of these lines for particulars regarding rates, time of trains and other details. Inquiries on the subject will be promptly answered if addressed to C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

LOW RATES.

Via Pennsylvania Lines.

Special reductions in fare over the Pennsylvania Lines will be granted for numerous events to take place this summer in various parts of the United States, in addition to local excursions. Some of the points to which tickets will be sold and dates of sale are as follows:

To Nashville, Tenn., daily to October 15th, for Tennessee Centennial and International Exposition.

To Winona Assembly Grounds, Eagle Lake (near Warsaw, Ind.), May 15th to August 31st, for Annual Assembly and Summer School.

To Celeron (Chautauqua Lake), July 11th and 12th, account Photographers' Association of America.

To Toronto, Canada, July 13th, 14th and 15th, for E worth League National Convention.

To Minneapolis, July 3d and 4th, for National Meeting, B. P. O. Elks.

To Chattanooga, July 13th, 14th and 15th, account Baptist Young Peoples' Union of America.

To Detroit, July 12th and 13th for National Republican League Meeting.

To Cincinnati, July 21st and 22d, for German Epworth League Meeting.

To Indianapolis, August 17th and 18th, for Y. P. C. U. Annual Convention.

To Indianapolis, September 8th and 9th, for National Encampment Sons of Veterans.

The reduced rates over the Pennsylvania Lines will not be restricted to members of the organization mentioned, but may be taken advantage of by the public generally. Excursion tickets may be obtained at ticket offices on the Pennsylvania System and will be sold over this route by connecting railways. Any Pennsylvania Line Ticket or Passenger Agent will furnish desired information concerning rates, time of trains, return limit, and other details to all applicants, or the same may be obtained by addressing C. L. Kimball, Assistant General Passenger Agent, Clevealnd, O.

EXCURSIONS TO NASHVILLE.

Low Rates for Tennessee Centennial.

The Tennessee Centennial and International Exposition will be in progress at Nashville, Tenn., from May until October inclusive. Special low rate round trip tickets will be sold via Pennsylvania Lines for this event. Full particulars concerning fare, dates of sale, time of trains, etc., may be obtained upon application to nearest Pennsylvania Line Ticket Agent, or by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

Steam Yachts and Marine Machinery.

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

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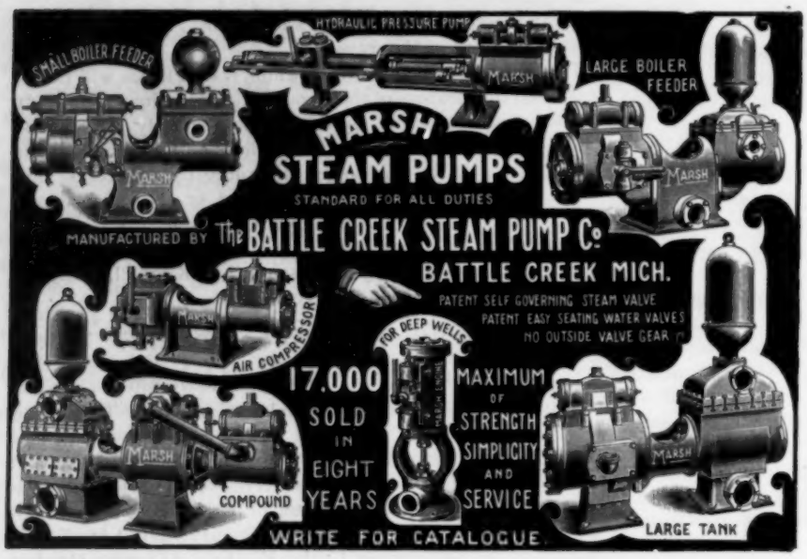

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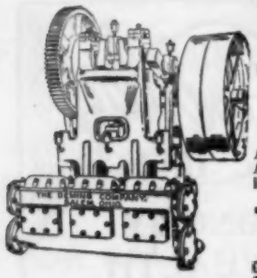

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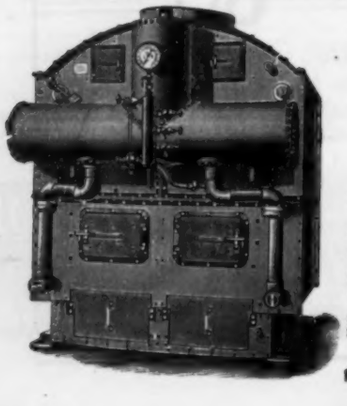

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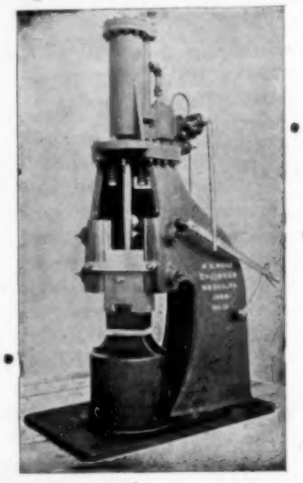

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* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:40 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	* 5:45 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

The Cleveland Terminal & Valley R. R. Co.

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Depot foot of So. Water St. / City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:20 P M	*7:10 A M
Akron, Canton & Valley Jct	*10:00 A M	*3:30 P M
Akron, Canton & Chicago	*8:10 A M	*6:35 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:25 P M	†11:00 A M

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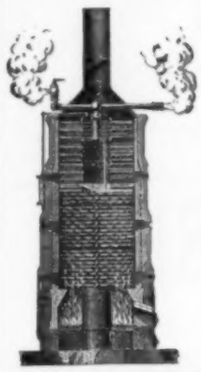

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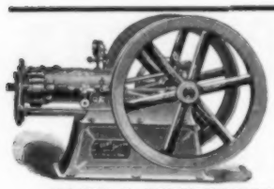

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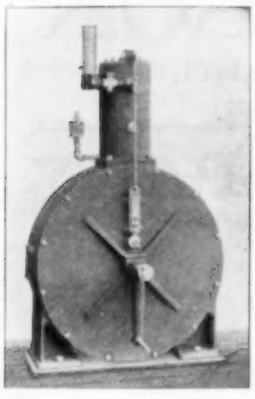

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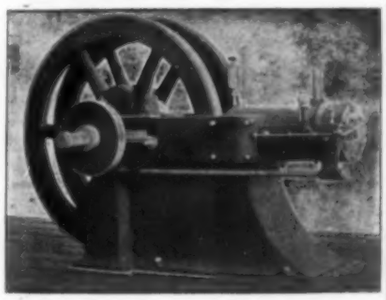

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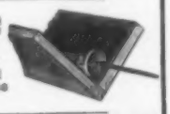

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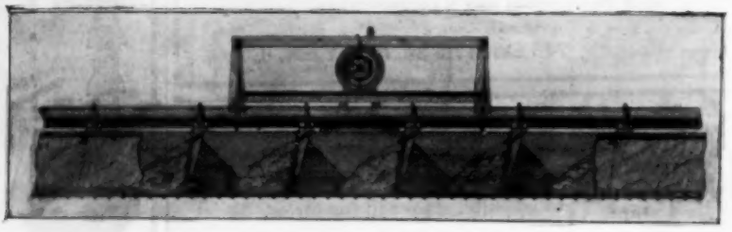

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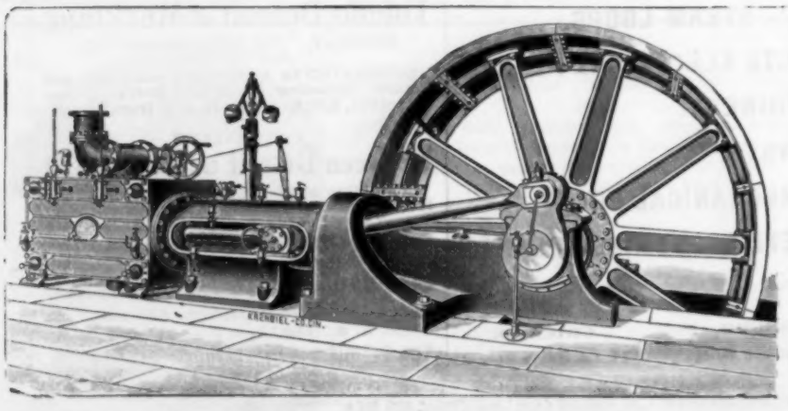

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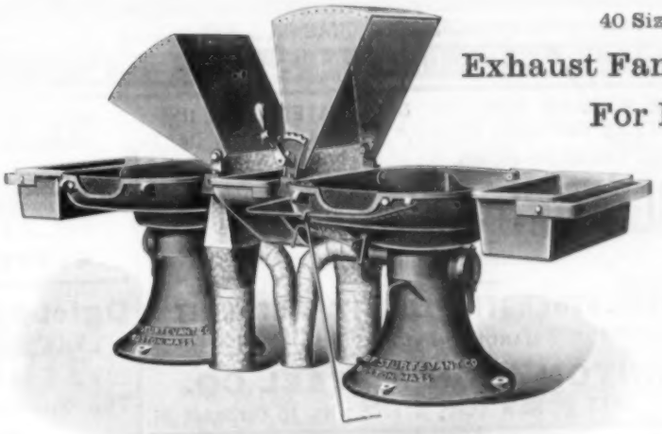

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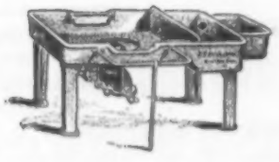

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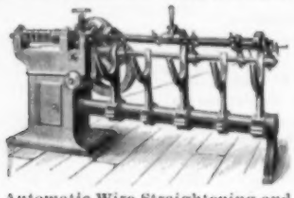

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Wm. Glader, Chicago, Ill.

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C. H. Besly & Co., Chicago, Ill.

Machine Shops—
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The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

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Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Metal Bearings—
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Metal Saws—
Q. & C. Co., Chicago, Ill.

Metal Stamping—
Oliver P. Clay Co., Cleveland, O.

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Lodge & Shipley Machine Tool Co., Cincinnati

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C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.

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Westinghouse Electric & Mfg. Co., Pittsburg
General Electric Co., Schenectady, N. Y.
Card Electric Co., Mansfield, O.

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Newport Sand Bank Co., Newport, Ky.
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Deming Co., Salem, O.
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Henry R. Worthington, Brooklyn, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.

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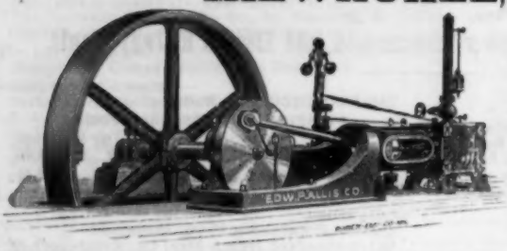

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The A B C of Iron.—A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron. CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to Reduce Cost of Mixture. Steel. Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron. Former price $2.00, NOW $1.00. Order of *The Iron Trade Review Co.*, 27 Vincent St., Cleveland, O.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@ 3.46
No. 1 Specular, Bessemer	3.05@ 3.17
No. 1 Bessemer hematite	2.60@ 2.90
Hematites No. 1 non-Bessemer	2.20@ 2.30
No 1. Specular, non-Bessemer	2.40@ 2.60

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CLEVELAND (f. o. b. cars):	
Bessemer	$ 9 65@ 9 90
No. 1 Strong Foundry	10 40@ 10 65
No. 2 Strong Foundry	9 65@ 10 15
No. 1 Gray Forge, red short	8 75
No. 2 Gray Forge, neutral	8 90
No. 1 American Scotch	10 65
No. 2 American Scotch	10 15
Lake Superior Charcoal	12 75@ 13 00
PITTSBURG:	
No. 1 Foundry	$10 50@ 10 75
No. 2 Foundry	10 00@ 10 25
Gray Forge	8 50@ 8 75
White and Mottled	8 50
Warm Blast Charcoal	14 50@ 15 00
Cold Blast Charcoal	18 00
Bessemer	9 75@ 9 90
CHICAGO:	
Lake Superior Charcoal	$13 00@$13 20
Local Coke Foundry No. 1	10 25@ 10 75
Local Coke Foundry No. 2	10 25@ 10 50
Local Coke Foundry No. 3	10 00@ 10 25
Local Scotch Foundry No. 1	10 50@ 10 75
Local Scotch Foundry No. 2	10 25@ 10 50
Local Scotch Foundry No. 3	10 00@ 10 25
Southern Coke No. 1	10 25@ 10 00
Southern Coke No. 2	9 75@ 10 00
Southern Coke No. 3	9 50@ 9 75
Southern No. 1 Soft	10 25@ 10 50
Southern No. 2 Soft	9 75@ 10 00
Southern Silveries	10 25@ 10 50
Jackson Co. Silveries	13 00@ 15 00
Ohio Silveries No. 1	13 00@ 15 00
Ohio Strong Softeners	12 00@ 12 25
Alabama Car Wheel	16 50@ 16 00
Malleable Bessemer	10 75@ 11 00
Coke Bessemer	11 50@ 12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 9 25@$ 9 50
Southern Coke No. 2 and No. 1 Soft	8 50@ 8 75
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	14 50@ 15 50
Tennessee Charcoal No 1	12 50@ 13 00
Jackson County Silvery No 1	12 50@ 13 00
Southern Coke, Gray Forge	8 00@ 8 25
" " Mottled	8 00
Standard Georgia Car Wheel	14 25@ 15 00
Tennessee " "	13 00@ 14 00
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$ @$10 75
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 50
Ohio Strong Softener No. 1	10 75
Jackson Co. Silvery No. 1	14 00
Lake Superior Charcoal	14 00
Southern Soft No. 1	10 75
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$ 9 50@$ 9 75
Southern Coke No. 2	9 00@ 9 25
Southern Coke No. 3	8 50@ 8 75
Southern Gray Forge	8 00@ 8 25
Southern Charcoal No. 1	13 00
Missouri Bessemer	12 00
Ohio Softeners	13 50
Lake Superior Car Wheel	14 50
Southern Car Wheel	14 50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$10 50
Old steel rails (6 ft. and over)	8 50
Old steel rails (6 ft. and under)	7 75
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No. 1 R. R. wrought scrap	$ 9 00
Mill scrap	6 50
No. 1 Machine cast scrap	8 00
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Axle turnings	7 00
Wrought turnings (free from cast)	5 50
Cast borings	4 55
Uncut wrought iron boilers	3 25
Steel boiler plates	7 00
Grate bars	5 00
Pipes and flues (clean)	6 50
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Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	5 00
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Beams and Channels (f. o. b. Cleveland)	1.10c
Angles	1.10c
Tees	1.20c
Universal Plates	1.10@1.15c
Sheared Plates	1.15c

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Rounds and Squares.—Bar Iron.

1 to 1½	1.05 Base
2 to 2½	.20 extra
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6¼ to 6½	2.20 "

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Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

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Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

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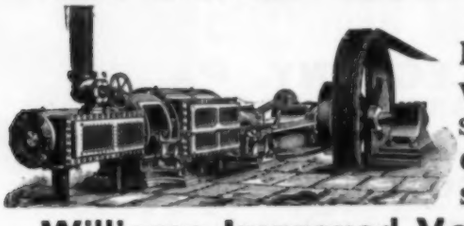

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For Direct Electrical and all High Class Work.

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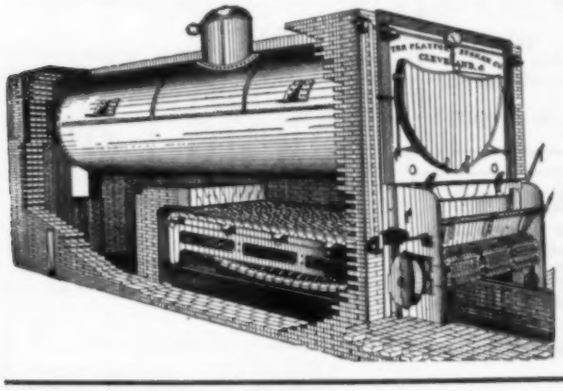

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Abolish smoke, to increase boiler capacity and to save fuel.

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And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7⅞	2.50 extra
¾ to ⅞	.10 "
⅝ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅛ to 1	.10 "
1 to 1 1-16 x ⅛ to ⅞	.20 "
¼ to 15-16 x ⅛ to ½	.40 "
⅝ to 11-16 x ⅛ to ⅝	.50 "
½ to 9-16 x ⅛ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¼ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos 10, 11 and 12	1.10 "
7-16 to ½ x No 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅞ to 1⅜	.40 extra.
¼ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅜	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¼ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes .1 c. extra.

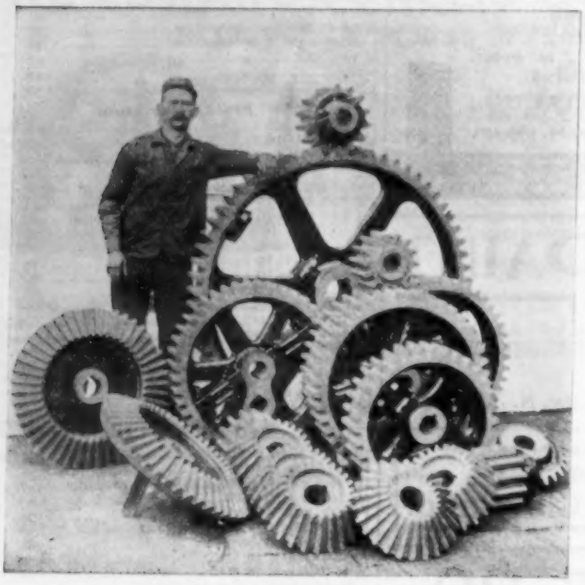
Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50	Base.
		Extras.	
1½ to 6,	" 10, 11, 12 or ¼"	.05	per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10	"
1 to 1⅜,	" 10, 11, 12 or ¼"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10 11, 12 or ¼"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10 11, 12 or ¼"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or ¼"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or ¼"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or ¼"	1.05	"

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.		
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60	Base
		Extras	
1 7-16 to 2,	" 17, 18, and 19	.05	per 100 lbs.
1 7-16 to 2,	" 20	.10	"
1 7-16 to 2,	" 21	.15	"
1 7-16 to 1¾,	" 22	.25	"
1 ⅝ to 1⅜,	" 13, 14 and 15	.05	"
1⅝ to 1¾	" 16, 17 and 18	.10	"



WASTED POWER MEANS Lost Profit.

Investigate the waste in gears and pinions with cast teeth over those with cut teeth. We will be glad to aid you if you will correspond with us.

R. D. NUTTALL CO.,

179 BOQUET STREET, ALLEGHENY, PA.

THE BRASS FOUNDERS' SUPPLY CO.

FURNACES, FLASKS, FOUNDRY Supplies and Specialties.

Send for our Catalogue and look at the Ribbed Flask.

R. M. BARNETT. 20-34 Prospect St., **NEWARK, N. J.** J. S. MUNDY.

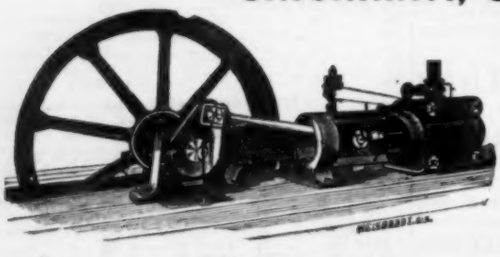
WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for PATENT CAP ROOFING at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES-IRON & STEEL ROOFING CO., Chicago and Niles, O.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	21	.20 "
1⅛ to 1⅜,	22	.30 "
15-16 and 1,	13, 14 and 15	.10 "
15-16 and 1,	16, 17 and 18	.15 "
15-16 and 1,	19 and 20	.20 "
15-16 and 1,	21	.25 "
15-16 and 1,	22	.35 "
⅞,	Nos. 13, 14 and 15	.20 "
⅞,	" 16, 17 and 18	.25 "
⅞,	" 19 and 20	.30 "
⅞,	" 21	.35 "
⅞,	" 23	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	" 16, 17 and 18	.35 "
¾ and 13-16	" 19 and 20	.40 "
¾ and 13-16	" 21	.45 "
¾ and 13-16	" 22	.50 "
¾ and 13-16	" 23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	" 16, 17 and 18	.40 "
11-16,	" 19 and 20	.50 "
11-16,	" 21	.60 "
11-16,	" 22	.70 "
11-16,	" 23	.80 "
⅝,	Nos. 13, 14 and 15	.40 "
⅝,	" 16, 17 and 18	.45 "
⅝,	" 19 and 20	.55 "
⅝,	" 21	.65 "
⅝,	" 22	.75 "
⅝,	" 23	.85 "
9-16,	" 13, 14 and 15	.45 "
9-16,	" 16, 17 and 18	.50 "
9-16,	" 19 and 20	.60 "
9-16,	" 21	.70 "
9-16,	" 22	.80 "
9-16,	" 23	.90 "
½,	" 13, 14 and 15	.55 "
½,	" 16, 17 and 18	.60 "
½,	" 19 and 20	.70 "
½,	" 21	.80 "
½,	" 22	.90 "
½,	" 23	1.00 "
7-16,	" 13, 14 and 15	.80 "
7-16,	" 16, 17 and 18	.90 "
7-16,	" 19 and 20	1.00 "
⅜,	" 13, 14 and 15	1.00 "
⅜,	" 16, 17 and 18	1.10 "
⅜,	" 19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

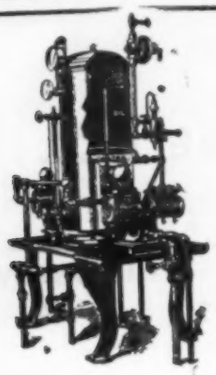
The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.

Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.



IMPROVED DUPLEX SYSTEM

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BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

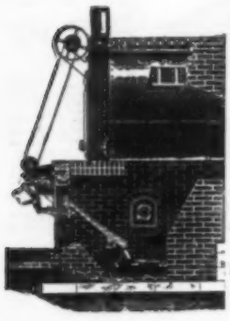
Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05
Above includes plates 90 inches wide.	
90 to 96 in. wide	¼c. ₩ extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1¼c. "
104 to 106 in. wide	special.

Flats cts. ₩s.

2 to 9-16 in. wide by 2 to ⅝ thick ..... .08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. ₩s.
1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in	.09
3⅜ to 4 in	.09½
⅝ to 11-16 and 4⅜	.10
⅝ to 6 in	.10½
¼ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 10
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four 10s	.62
Butt " " " four 10s	.62½
Lap " galv. " four 10s	.52½
Butt " " " four 10s	.50
Boiler tubes 2½" and smaller	.70
Boiler tubes 2½" and larger	.75
Casting screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths' { Hill's	dis 40
Blacksmiths' { Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 1 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1⅛"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1⅛"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5¾c	3 c
10 ₩ cans, 10 in case	6 c	6¾c	5 c
10 lb cans less than 10	10 c	10 c	½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 50@50&5
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Crant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton.....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....10c
" " " " over 5 lbs.....8c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15¼	11¼	8½	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.
{ Car lots.....$1.35
{ Less than car lots....$1.45

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35c
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75&5
" " Nos. 27@36.....dis 75&10&5
Coppered Nos. 0 to 18, market list.....dis 70@70&5
Galvanized Nos. 0 to 18 " " .....dis65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

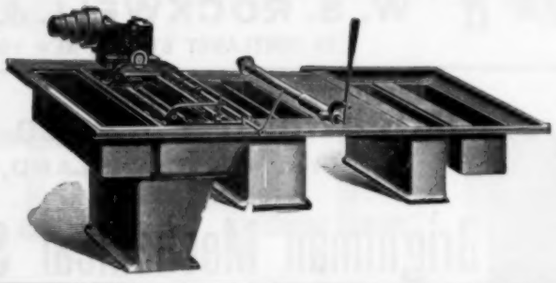
It is a mistaken idea that any old thing will do for an emery grinder. There is no better sense shown by anybody than to buy that which is the most durable for the least money. It is not economy to buy a thing simply because it is cheap. It is better to purchase the best in grinding machinery. This means Diamond grinders, for the reason that our long experience, skilled workmen and large facilities enable us to carry out to the fullest our ideas in manufacturing which are to build only the best machinery and to sell it at a fair margin of profit. If you are in the market for any grinding machinery or are interested in these tools write to us for our catalogue.

DIAMOND MACHINE CO.,

PROVIDENCE, R. I. and CHICAGO, ILL.

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY.



Rolling Mills, Sand and Chill ROLLS.

When You are Offered Jenkins' or Jenkins Bros.' Discs that have Trade Mark same as cut, they are all right for high pressure steam. All others are imitations and you cannot hold us responsible. If you cannot get our discs from your dealer, send to us for them. (1)

Jenkins Bros., 71 John st., N. Y. 31 N. Canal st. Chicago. 117 N. 4th st. Philadelphia. 17 Pearl st., Boston

Not every insertion of every advertiser's card brings an order for the advertiser's good; no more does every visit of the traveling salesman result in a sale.

There is a vast deal in familiarity with the type and phrase in which a manufacturer makes himself known to the advertisement reader, just as the personal acquaintance of his traveling salesman gets him a hearing when a strange face and a strange voice are bowed out with a "busy day's" courtesies.

The best advertisers, the most successful advertisers, the advertisers who get returns, are those who keep everlastingly at it.

This is a case in which familiarity breeds business.

"Metallurgy of Cast Iron,"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1142 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

BELT DRIVEN DIRECT DRIVEN
DYNAMOS AND MOTORS
SLOW SPEED HIGH GRADE

THE CARD ELECTRIC CO.
MANSFIELD, OHIO, U.S.A.

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 32 Wilshire Bldg., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 Wilshire Bldg., Cleveland, O.

J. E. WOLCOTT, Special Agent, Room 42, Wilshire Bldg., Cleveland, O.

CLEVELAND ELECTROTYPE CO.
ELECTROTYPING ENGRAVING AND STEREOTYPING.
50 HIGH ST. — TEL. 2139.

ESTABLISHED 1854.
PETER GERLACH & CO.,
MAKERS OF
Saws, Tools and Machinery.
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland, Ohio, U. S. A.

THE BETHLEHEM IRON CO.,
WORKS AND PRINCIPAL OFFICE,
SOUTH BETHLEHEM, PENNA.
RAILS, BILLETS, MUCK BARS.
FORGINGS of all descriptions, either Solid or Hollow, made from Fluid-Compressed, Hydraulic Forged Open Hearth Steel.
PLATES for all purposes..
NEW YORK OFFICE, 100 BROADWAY. PHILADELPHIA OFFICE, 421 CHESTNUT ST.
CHICAGO OFFICE, MARQUETTE BUILDING.

No. 3 Power Press

TOLEDO MACHINE & TOOL CO.,
501-505 Superior St., Toledo Ohio.
We manufacture
Power Punches. Forging Presses.
Power Presses. Trimming Presses.
Straight Sided Double Pitman Presses.
Drop Presses.
Embossing Presses. Automatic Feed Presses.
Stamping Presses. Power Slitting Machines.
Riveting Machines. Power Shears.
Special and Automatic Machinery Dies for all classes of work in sheet metals.
Write for catalogue and prices.

No. 25 Power Press

THE "CLEARFIELD" FIRE BRICK
MANUFACTURED BY
THE CLEARFIELD FIRE BRICK CO., Limited,
Office and Works at CLEARFIELD, PA.
Room 305 Ferguson Bldg., Pittsburg, Pa., John Richardson, Agent.

THE CHICAGO GAS and GASOLINE ENGINE
The simplest gas and gasoline engine on the market. Has no equal for absolute, steady speed and durability. It is a dwarf in size and a Samson in strength.
Catalogue sent on application.
MANUFACTURED BY
J. J. NORMAN CO., 60 S. Clinton St., Chicago, Ill.

THE JACKSON SAND MINING CO.,
JACKSON, O.
Producers of SILICA, FIRE and CORE SAND. Also MOLDING SAND for STEEL CASTINGS. Write for Prices.

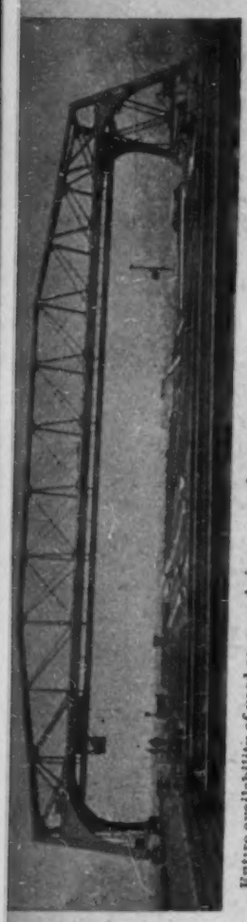
THE BROWN HOISTING AND CONVEYING MACHINE CO. CLEVELAND, O.
MACHINERY FOR HANDLING COAL AND ORE.
CRANES
NEW YORK, HAVEMEYER BLDG.
PITTSBURG, CARNEGIE BLDG.
CHICAGO, MARQUETTE BLDG.

KING'S SIX TON ELECTRIC CRANE
Can be furnished at low cost.
Write for full information to the MARION STEAM SHOVEL CO Marion, Ohio.

Subscribe for the Iron Trade Review, $3 per year.

FIRE BRICK
DOVER FIRE BRICK CO.,
MANUFACTURERS OF
Furnace, Mill and Special Shape Fire Brick.
Office, 44 Mercantile Bank Bldg.,
CLEVELAND, OHIO.

THE
VELLMAN,
SEAVER
ENGINEERING CO.,
1405
ew England Bldg.,
CLEVELAND, O.
ENGINEERS
AND
CONTRACTORS.



Entire availability of yard room and cheapness of construction are among the advantages of this crane.

200 ft. span.
LECTRIC
GANTRY
CRANE
built for
AMBRIA IRON CO.
Johnstown, Pa
Write us for further description. We can build these cranes in whatever size and capacity may best suit your purpose.

THE HART OR DETROIT
Emery Corundum Wheels and Machinery.
Write to J. WENDELL COLE, M. E.,
District Manager, No. 911 Chicago Opera House Block, Chicago, Ill., or Box 84, Columbus, O
☞ N. B.—Also Agent for WM. SELLERS & CO.'s SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

THE HARRINGTON & KING PERFORATING CO.
CHICAGO.

METALS PERFORATED AS REQUIRED FOR
SCREENS OF ALL KINDS
AND FOR USE IN

Milling and Mining Machinery	Stone, Coal and Ore Screens
Reduction and Concentrating Works	Stamp Battery Screens
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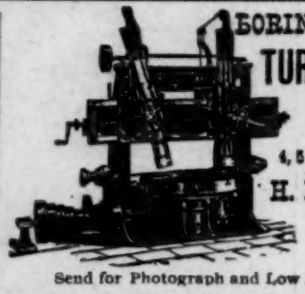

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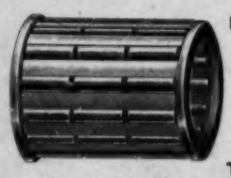

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